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Until the present epoch the sciences have been the patrimony of a few; but they are already become common, and the moment approaches in which their elements, their principles, and their most simple practice, will become really popular. Then it will be seen how truly universal their utility will be in their application to the Arts, and their influence on the general rectitude of the mind.—CONDORCET.

MR. HOTCHKISS' PATENT GRIST MILL.

Fig. 1.

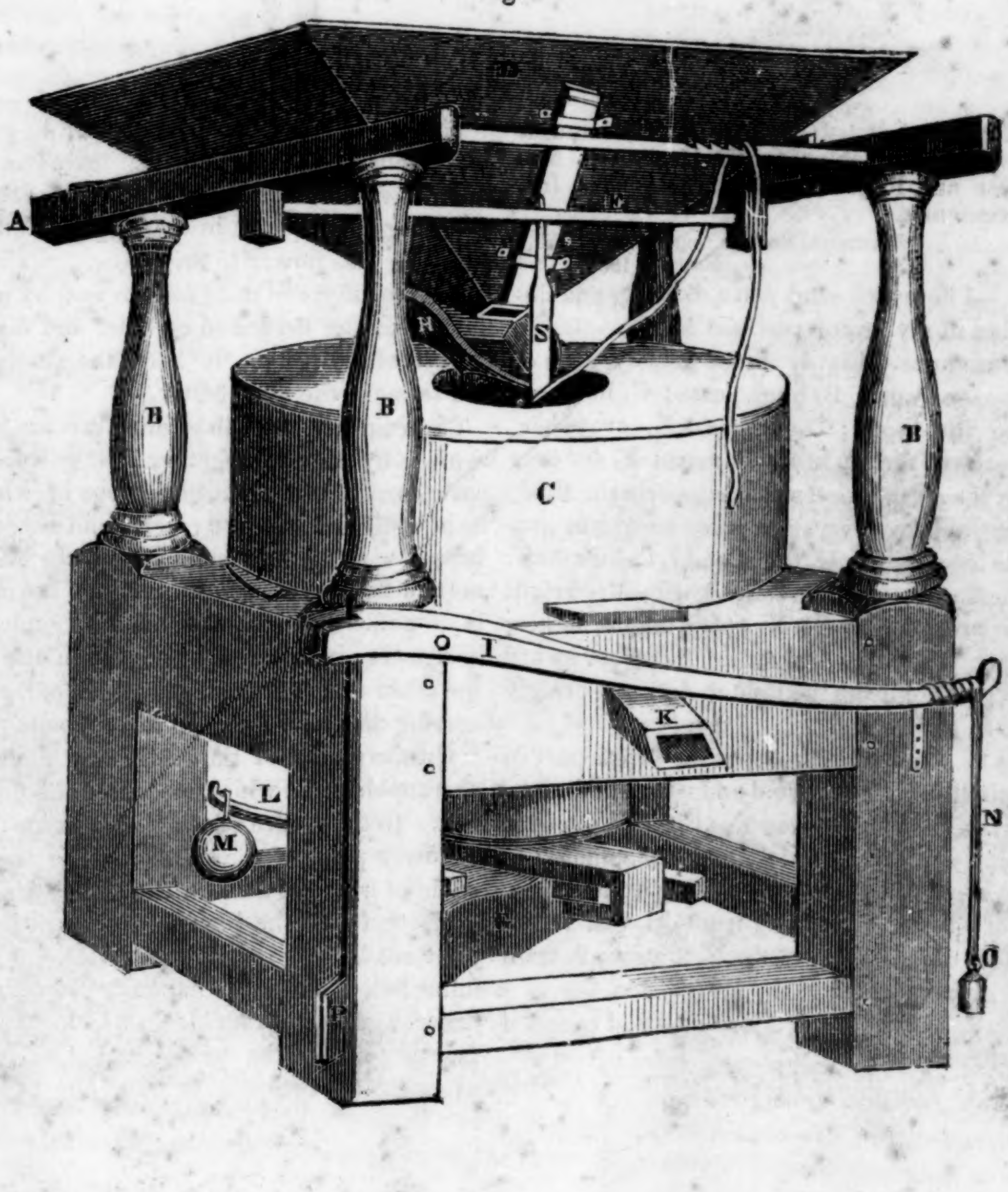
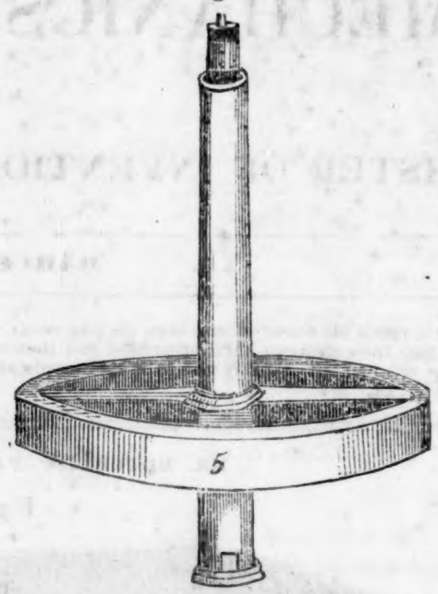


Fig. 2.

Fig. 3.

Fig. 4.



Mr. Hotchkiss' Patent Grist Mill. Communicated by the Inventor, for the Mechanics' Magazine and Register of Inventions and Improvements.

WINDSOR, Broome county, New-York, March 7, 1833.

SIR,—I herewith send you a drawing and description of my improved Grist Mill.

REFERENCES.—Fig. 1. A, the ladder, or top of the hopper frame; B, husk posts; C, hoop enclosing the stone; D, hopper; E, cross-bar, that receives the top of the damsel; F, do. over which the strap crosses that supports the shoe; G, the pressure lever, that gives weight or gravity to the runner; H, the shoe; I, lighter staff; K, meal spout; L, pressure lever; M, weight on the pressure lever; N, strap on the lighter staff; O, weight on said strap; P, rod, or sword piece, that connects the lighter staff and bridge-tree; S, the damsel.

Fig. 2. The top represents the screw part of the spindle; 2, balance rind and wings of flights; 3, driver, and do. do. (see also Fig. 3); 4, collar to spindle; 5, pully on lower end of spindle; 6, screws, or staples, to hold binding irons; 7, inside of oil-pot; 8, binding irons, two of which and foot of spindle form the lock joint; 9, tram block, which is fast to the bridge-tree.

Fig. 3. Driver, and balance rind and wings of flights (see also Fig. 2.)

Fig. 4. The propelling wheel.

The principal objects to be effected by my improvement are to perform fast grinding with small stones, without heating the flour; thereby lessening the expense in erecting the mill, and requiring less power to drive it.

Also to improve mills now in use, by placing the hereinafter described cylinder and flights in the eye of the runner, to keep the stones cool and to make the flour better.

The frame on which the stones, &c. are placed, is made by framing together four posts, one at each corner, and eight girts, four of which to be of sufficient width to receive and support the beams bearing the stones and the flooring around the bed stone. One of the lower girts is of sufficient size to receive an end of the bridge-tree inserted in a mortise in the same; the other end resting on the centre of the brake moving on a joint inside of the opposite girt.

On the middle of the bridge-tree rests a key or tram block, in which is secured the oil-pot or box. In the centre of the oil-box turns the foot or lower point of the spindle. The spindle is made of iron and steel, with a flange or circular projection near the lower end. An iron lock-joint made in two parts encircles the spindle immediately above the flange or projection, and is screwed to the tram block, which secures the foot or point of the spindle in the oil-box and prevents its escaping or bounding out there-

from. The spindle, as high as the collar, and square part on which is placed the driver, is made in the usual manner. The shoulders of the spindle above the driver are to be rounded off in a semi-globular form, on which rests the balance-rind and runner; the balance-rind, where it rests on the semi-globular shoulder, being of a semi-spherical concave shape, its upper side is convex; on which, and around the spindle, is put a circular washer or catteral concave on its under side, resting on the balance-rind. Above this is put a nut, screwed on the spindle, the threads of which being cut in a contrary direction from the turning of the stone, the catteral may be secured by a key passing through the spindle; or it may be otherwise fastened. The spindle is connected and suspended from the runner; the latter being nicely balanced on the spindle, having a motion similar to a ship's compass, and, whilst running, constantly forming itself to the bed-stone in the nicest manner. The damsel is screwed, or otherwise fastened, to the upper end of the spindle.

A pully whirl, drum or cog-wheel, is placed on the spindle to drive the same. A weight is added to the spindle in order to give greater power or gravity to the runner when required, which may, therefore, be of smaller size, and will move with greater velocity; thereby lessening the expense and power required in constructing and driving the mill.

The driver and balance-rind are curved or twisted in such a manner as to answer the purpose of flights or wings, which, during the operation of the mill, carry round and force the air which is in the eye of the runner between it and the bed-stone along deep channels cut in the runner—or pipes inserted to distribute the air—and out of the circumference thereof: also through grooves cut on the periphery of a hollow cylinder inserted in the eye of the runner, creating a current of air through these grooves, and a draft or suction through the eye, causing a more free, easy, and quick admission of the grain between the stones.

Mills that grind fast are liable to heat the flour, and consequently injure it,—but the currents of air, created as before described, and driven between the stones, prevent this from taking place.

To the brake may be attached a screw or lighter staff in the usual way, to raise or sink the runner at pleasure. Also, near one end of the brake, and on it are placed weights and springs, or a fulcrum supporting a lever, attached to one of the corner posts of the frame by a bolt passing through one of its ends, and having a weight suspended near the other end, in the manner of a steelyard, by which the gravity or power of the runner may be increased or diminished at pleasure, so that an equilibrium is formed between the power required and power applied.

The hoop, hopper-frame, hopper, and shoe, are made in the usual manner.

What I claim as my invention, and for which I obtained letters patent, is increasing the gravity of the runner by means of weight attached to the spindle, or by means of the flange near the bottom of the spindle and the lock-joint fastened to the tram-block on the bridge-tree, with the lever and weight acting on the same; the spindle passing through the balance-rind, secured to and suspended from the runner; the inserting wings or flights in the eye; the shape of the driver and balance-rind causing currents of air to pass between the stones in pipes or otherwise, and through grooves on the circumference of a hollow cylinder placed within the eye of the runner, carrying off the dirt and keeping the stones from heating, likewise causing a draft through the eye, which allows the grain to pass more freely to the grinding stones.

The mills are portable, and can be attached to any machinery, horse, steam, or water, with about two horse power, and are constructed on such a principle as to perform fast grinding with small stones, without heating the flour, and thereby greatly lessening the expense in erecting mills, and requiring much less power to grind them. The improvement can also be applied to mills now in use of the common construction. I am, Sir, yours, &c.

Gideon Hotchkiss.

[We are much obliged by Mr. Hotchkiss' communication: it is from such sources that we look with confidence for much valuable matter to enrich our columns. Mr. Hotchkiss possesses certificates of the utility of his invention from upwards of seventy practical men, including many millers and millwrights, who have witnessed the operation.—Ed. M. M.]

Cement for Glass or China.—An ounce of pure gum mastic is to be dissolved in q. s. of

well rectified alcohol, and the same quantity of ichthyocolla steeped in water till soft, and then dissolved in alcohol; these solutions are to be mixed, and a quarter of an ounce of gum ammoniac added. The whole is now to be exposed to a gentle heat till perfectly amalgamated, when it is to be poured into a vial and kept well corked. When it is to be used, both the vial and the vessel to be mended are to be warmed, and the united fragments should be pressed in close contact for at least twelve hours.—[Journ. des Connais. Usuel.]

On Heat—Its spreading by Conduction—Result of Experiments on Metals, Glass, Earths, Wood, Air, &c.—Admirable Adaptation of the Substances which Nature has provided as Clothing for Inferior Animals to the Wants and Conveniences of Man, &c.
[From Dr. Arnott's Elements of Physics.]

If one end of a rod of iron be held in the fire, a hand grasping the other end soon feels the heat coming through it. Through a similar rod of glass the transmission is much slower, and through one of wood it is slower still. The hand would be burned by the iron before it felt warm in the wood, although the inner end were blazing.

On the fact that different substances are permeable to heat, or have the property of conducting it, in different degrees, depend many interesting phenomena in nature and in the arts: hence it was important to ascertain the degrees exactly, and to classify the substances. Various methods for this purpose have been adopted. For solids—similar rods of the different substances, after being thinly coated with wax, have been placed with their inferior extremities in hot oil, and then the comparative distances to which, in a given time, the wax was melted, furnished one set of indications of the comparative conducting powers: or, equal lengths of the different bare rods being left above the oil, and a small quantity of explosive powder being placed on the top of each, the comparative intervals of time elapsing before the explosions gave another kind of measure: or, equal balls of different substances, with a central cavity in each to receive a thermometer, being heated to the same degree and then suspended in the air to cool, until the thermometer fell to a given point, gave still another list. A modification of the last method was adopted by Count Rumford to ascertain the relative degrees in which furs, feathers, and other materials used for clothing, conduct heat, or, which is the same thing, resist its passage. He covered the ball and stem of a thermometer with a certain thickness of the substance to be tried, by placing the thermometer in a large bulb and stem of glass, and then filling the interval between them with the substance; and, after heating this apparatus to a certain degree, by dipping it in liquid of the desired temperature, he surrounded it by ice, and marked the comparative times required to cool the thermometer a certain number of degrees. The figures following the names of some of the substances in the subjoined list, mark the number of seconds required respectively for cooling it 60°.

These experiments have shown as a general rule, that density in a body favors the passage of heat through it. The best conductors are the metals, and then follow in succession diamond, glass, stones, earths, woods, &c. as here noted:

Metals—silver, copper, gold, iron, lead.	
Diamond.	
Glass.	
Hard stones.	
Porous earths.	
Woods.	
Fats or thick oils.	
Snow.	
Air	576
Sewing Silk	917
Wood ashes	927
Charcoal	937
Fine lint	1,032
Cotton	1,046
Lamp-black	1,117
Wool	1,118
Raw Silk	1,284
Beavers' fur	1,296
Eider down	1,305
Hares' fur	1,315

Air appears near the middle of the preceding list, but if its particles are not allowed to move about among themselves so as to *carry* heat from one part to another, it *conducts* (in the manner of solids) so slowly that Count Rumford doubted whether it conducted at all. It is probably the worst conductor known, that is, the substance which when at rest impedes the passage of heat the most. To this fact

seems to be owing in a considerable degree the remarkable non-conducting quality of porous or spongy substances, as feathers, loose filamentous matter, powders, &c. which have much air in their structure, often adherent with a force of attraction which immersion in water, or even being placed in the vacuum of an air pump, is insufficient to overcome.

While contemplating the facts recorded in the above table, one cannot but reflect how admirably adapted to their purposes the substances are which nature has provided as clothing for the inferior animals; and which man afterwards accommodates with such curious arts to his peculiar wants. Animals required to be protected against the chills of night and the biting blasts of winter, and some of them which dwell among eternal ice, could not have lived at all but for a garment which might shut up within it nearly all the heat which their vital functions produced. Now, any covering of a metallic or earthy or woody nature would have been far from sufficing; but out of a wondrous chemical union of carbon with the soft ingredients of the atmosphere, those beautiful textures are produced called fur and feather, so greatly adorning while they completely protect the wearers: textures, moreover, which grow from the bodies of the animals, in the exact quantity that suits the climate and season, and which are reproduced when by any accident they are partially destroyed. In warm climates the hairy coat of quadrupeds is comparatively short and thin, as in the elephant, the monkey, the tropical sheep, &c. It is seen to thicken with increasing latitude, furnishing the soft and abundant fleeces of the temperate zones; and towards the poles it is externally shaggy and coarse, as in the arctic bear. In amphibious animals, which have to resist the cold of water as well as of air, the fur grows particularly defensive, as in the otter and beaver. Birds, from having very warm blood, required plenteous clothing, but required also to have a smooth surface, that they might pass easily through the air: both objects are secured by the beautiful structure of feathers, so beautiful and wonderful that writers on natural theology have often particularized it as one of the most striking exemplifications of creative wisdom. Feathers, like fur, appear in kind and quantity suited to particular climates and seasons. The birds of cold regions have covering almost as bulky as their bodies, and if it be warm in those of them which live only in air, in the water-fowl it is warmer still. These last have the interstices of the ordinary plumage filled up by the still more delicate structure called down, particularly on the breast, which in swimming first meets and divides the cold wave. There are animals with warm blood which yet live very constantly immersed in water, as the whale, seal, walrus, &c. Now neither hair nor feathers, however oiled, would have been a fit covering for them; but kind nature has prepared an equal protection in the vast mass of fat or thick oil which surrounds their bodies—substances which are scarcely less useful to man than the furs and feathers of land animals.

While speaking of clothing, we may remark that the bark of trees is also a structure very slowly permeable to heat, and securing therefore the temperature necessary to vegetable life.

And while we admire what nature has thus done for animals and vegetables, let us not overlook her scarcely less remarkable provision of ice and snow, as winter clothing for the lakes and rivers, for our fields and gardens. Ice, as a protection to water and its inhabitants, was considered in the explanation of why, although solid, it swims on water. We have now to remark that snow, which becomes as a pure white fleece to the earth, is a structure which resists the passage of heat nearly as much as feathers. It, of course, can defend only from colds below 32° or the freezing point; but it does so most effectually, preserving the roots and seeds and tender plants during the severity of winter. When the green blade of wheat and the beautiful snow-drop flower appear in spring rising through the melting snow, they have recently owed an important shelter to their wintry mantle. Under deep snow, while the thermometer in the air may be far below zero, the temperature of the ground rarely remains below the freezing point. Now this temperature, to persons some time accustomed to it, is mild and even agreeable. It is much higher than what often prevails for long periods in the atmosphere of the centre and north of Europe. The Laplander, who during his long winter lives under ground, is glad to have additionally over head a thick covering of snow. Among the hills of the west and north of Bri-

tain, during the storms of winter, a house or covering of snow frequently preserves the lives of travellers, and even of whole flocks of sheep, when the keen north wind, catching them unprotected, would soon stretch them lifeless along the earth.

It is because earth conducts heat slowly that the most intense frosts penetrate but a few inches into it, and that the temperature of the ground a few feet below its surface is nearly the same all the world over. In many mines, even although open to the air, the thermometer does not vary one degree in a twelvemonth. Thus also water in pipes two or three feet under ground does not freeze, although it may be frozen in all the smaller branches exposed above. Hence, again, springs never freeze, and therefore become remarkable features in a snow-covered country. The living water is seen issuing from the bowels of the earth, and running often a considerable way through fringes of green, before the gripe of the frost arrests it; while around it, as is well known to the sportsman, the snipes and wild duck and other birds are wont to congregate. A spring in a frozen pond or lake may cause the ice to be so thin over the part where it issues, that a skater arriving there will break through and be destroyed. The same spring water which appears warm in winter is deemed cold in summer, because, although always of the same heat, it is in summer surrounded by warmer atmosphere and objects. In proportion as buildings are massive, they acquire more of those qualities which have now been noticed of our mother earth. Many of the gothic halls and cathedrals are cool in summer and warm in winter—as are also old fashioned houses or castles with thick walls and deep cellars. Natural caves in the mountains or sea-shores furnish other examples of a similar kind.

When in the arts it is desired to prevent the passage of heat out of or into any body or situation, a screen or covering of a slow conducting substance is employed. Thus, to prevent the heat of a smelting or other furnace from being wasted, it is lined with fire bricks, or is covered with clay and sand, or sometimes with powdered charcoal. A furnace so guarded may be touched by the hand, even while containing within it melted gold. To prevent the freezing of water in pipes during the winter, by which occurrence the pipes would be burst, it is common to cover them with straw ropes, or coarse flannel, or to enclose them in a larger outer pipe with dry charcoal, or saw dust, or chaff, filling up the interval between. If a pipe, on the contrary, be for the conveyance of steam or other warm fluid, the heat is retained, and therefore saved by the very same means. Ice houses are generally made with double walls, between which dry straw placed, or saw dust, or air, prevents the passage of heat. Pails for carrying ice in summer, or intended to serve as wine coolers, are made on the same principle—*viz.* double vessels, with air or charcoal filling the interval between them. A flannel covering keeps a man warm in winter—it is also the best means of keeping ice from melting in summer. Urns for hot water, tea pots, coffee pots, &c. are made with wooden or ivory handles, because if metal were used, it would conduct the heat so readily that the hand could not bear to touch them.

It is because glass and earthen ware are brittle, and do not allow ready passage to heat, that vessels made of them are so frequently broken by sudden change of temperature. On pouring boiling water into such a vessel, the internal part is much heated and expanded (as will be explained more fully in a subsequent page) before the external part has felt the influence, and this is hence riven or cracked by its connection with the internal. A chimney mirror is often broken by a lamp or candle placed on the marble shelf too near it. The glass cylinder of an electrical machine will sometimes be broken by placing it near the fire, so that one side is heated while the other side receives a cold current of air approaching the fire from a door or window. A red hot rod of iron drawn along a pane of glass will divide it almost like a diamond knife. Even cast iron, as backs of grates, iron pots, &c. although conducting readily, is often, owing to its brittleness, cracked by unequal heating or cooling, as from pouring water on it when hot. Pouring cold water into a heated glass will produce a similar effect. Hence glass vessels intended to be exposed to strong heats and sudden changes, as retorts for distillation, flasks for boiling liquids, &c. are made very thin, that the heat may pervade them almost instantly and with impunity.

There is a toy called a *Prince Rupert's Drop*, which well illustrates our present sub-

ject. It is a lump of glass let fall while fused into water, and thereby suddenly cooled and solidified on the outside before the internal part is changed; then as this at last hardens and would contract, it is kept extended by the arch of external crust, to which it coheres. Now if a portion of the neck of the lump be broken off, or if other violence be done, which jars its substance, the cohesion is destroyed, and the whole crumbles to dust with a kind of explosion. Any glass cooled suddenly when first made remains very brittle, for the reason now stated. What is called *Bologna jar* is a very thick small bottle thus prepared, which bursts by a grain of sand falling into it. The process of annealing, to render glass ware more tough and durable, is merely the allowing it to cool very slowly by placing it in an oven, where the temperature is caused to fall gradually. The tempering of metals by sudden cooling seems to be a process having some relation to that of rendering glass hard and brittle.

It is the difference of conducting power in bodies which is the cause of a very common error made by persons in estimating the temperature of bodies by the touch. In a room without a fire all the articles of furniture soon acquire the same temperature; but if in winter a person with bare feet were to step from the carpet to the wooden floor, from this to the hearthstone, and from the stone to the steel fender, his sensation would deem each of these in succession colder than the preceding. Now the truth being that all had the same temperature, only a temperature inferior to that of the living body, the best conductor, when in contact with the body, would carry off heat the fastest, and would therefore be deemed the coldest. Were a similar experiment made in a hot house or in India, while the temperature of every thing around was 98°, *viz.* that of the living body, then not the slightest difference would be felt in any of the substances: or lastly, were the experiment made in a room where by any means the general temperature was raised considerably above blood heat, then the carpet would be deemed considerably the coolest instead of the warmest, and the other things would appear hotter in the same order in which they appeared colder in the winter room. Were a bunch of wool and a piece of iron exposed to the severest cold of Siberia, or of an artificial frigioric mixture, a man might touch the first with impunity (it would merely be felt as rather cold); but if he grasped the second, his hand would be frost bitten and possibly destroyed: were the two substances, on the contrary, transferred to an oven, and heated as far as the wool would bear, he might again touch the wool with impunity (it would then be felt as a little hot,) but the iron would burn his flesh. The author has entered a room where the temperature from hot air admitted was sufficiently high to boil the fish, &c. of which he afterwards partook at dinner; and he breathed the air with very little uneasiness. He could bear to touch woollen cloth in this room, but no body more solid.

The foregoing considerations make manifest the error of supposing that there is a positive warmth in the materials of clothing. The thick cloak which guards a Spaniard against the cold of winter is also in summer used by him as protection against the direct rays of the sun: and while in England flannel is our warmest article of dress, yet we cannot more effectually preserve ice than by wrapping the vessel containing it in many folds of softest flannel.

In every case where a substance of different temperature from the living body touches it, a thin surface of the substance immediately shares the heat of the bodily part touched—the hand generally; and while in a good conductor, the heat so received quickly passes inwards, or away from the surface, leaving this in a state to absorb more, in the tardy conductor the heat first received tarries at the surface, which consequently soon acquires nearly the same temperature as the hand, and therefore, however cold the interior of the substance may be, it does not cause the sensation of cold. The hand on a good conductor has to warm it deeply, a slow conductor it warms only superficially. The following cases farther illustrate the same principle. If the ends of an iron poker and of a piece of wood of the same size be wrapped in paper and then thrust into a fire, the paper on the wood will begin to burn immediately, while that on the metal will long resist: or if pieces of paper be laid on a wooden plank and on a plate of steel, and then a burning coal be placed on each, the paper on the wood will begin to burn long before that on the plate. The explanation is, that the paper in contact with the good conductor loses to this so rapidly the heat received from the coal, that it remains

at too low a temperature to inflame, and will even cool to blackness the touching part of the coal; while on the tardy conductor the paper becomes almost immediately as hot as the coal. It is because water exposed to the air cannot be heated beyond 212°, that it may be made to boil in an egg-shell or a vessel made of paper, held over a lamp, without the containing substance being destroyed; but as soon as it is dried up, the paper will burn and the shell will be calcined, as the solder of a common tinned kettle melts under the same circumstances. The reason why the hand judges a cold liquid to be so much colder than a solid of the same temperature is, that, from the mobility of the liquid particles among themselves, those in contact with the hand are constantly changing. The impression produced on the hand by very cold mercury is almost insufferable, because mercury is both a ready conductor and a liquid. Again, if a finger held motionless in water feel cold, it will feel colder still when moved about; and a man in the air of a calm frosty morning does not experience a sensation nearly so sharp as if with the same temperature there be wind. A finger held up in the wind discovers the direction in which the wind blows by the greater cold felt on one side; the effect being still more remarkable, if the finger is wetted. If a person in a room with a thermometer were with a fan or bellows to blow the air against it, he would not thereby lower it, because it had already the same temperature as the air, yet the air blown against his own body would appear colder than when at rest, because, being colder than his body, the motion would supply heat-absorbing particles more quickly. In like manner, if a fan or bellows were used against a thermometer hanging in a furnace or hot-house, the thermometer would suffer no change, but the air moved by them against a person would be distressingly hot, like the blasting sirocco of the sandy deserts of Africa. If two similar pieces of ice be placed in a room somewhat warmer than ice, one of them may be made to melt much sooner than the other, by blowing on it with a bellows. The reason may here be readily comprehended why a person suffering what is called a cold in the head, or catarrh from the eyes and nose, experiences so much more relief on applying to the face a handkerchief of linen or cambric than one of cotton: it is that the former by *conducting* readily absorbs the heat and diminishes the inflammation, while the latter, by refusing to give passage to the heat, increases the temperature and the distress. Popular prejudice has held that there was a poison in cotton.

Iron Boats—*Expedition to the Niger.*—Extract of a letter from Mr. Richard Lander, dated Isle de Loz, Coast of Africa, Sept. 6, 1832, on board the Quorra Steamer:—"I write merely to inform you we arrived here on the 3d instant, all well, and leave for Cape Coast this evening. All the vessels have behaved very well. We have had several tornadoes: the lightning was felt more on board the Quorra than the iron steamer; it remained on our decks, but it merely struck the sides of the latter, and glided off into the water. This will give you an idea that an iron vessel is even safer than one built of wood. On board the Quorra we suffer much from the smell of bilge water, while the iron boat has not made one inch of water since she sailed from Liverpool, and she is never warmer than the water she floats in."

Mr. Berrian's Invention for propelling Carriages over Hills on Inclined Planes. [Communicated by the Inventor, for the Mechanics' Magazine.]

A new and useful improvement, made by Richard Berrian, of the city of New-York, on Wheels and Axles of the Locomotive Engine, as well as the Rails on the Roads, for the purpose of propelling Cars and Carriages over Hills and Mountains, on Inclined Planes, by means of Wheels or Segments, cogged, and attached to the sides of the large Wheels. The rails may be on either side of the wheels, rising sufficiently high for the cogs to reach and run into each other. The rails must be laid down cogged, and fitted to receive the cogged wheel at the foot of the hill, or at any of the inclined planes intended for that purpose; or, you may lay down a cogged rail in the centre of those two that have already been laid down, or may hereafter be laid down, at the rise or elevation of a hill or mountain requiring the same to be done; or, you may place a stationary cogged wheel on the centre of the axle, to receive the cogged segment on the centre rail, then pass the ends of the axle through

the boxes in the hubs of the wheels, cranked at the ends, so that they may be taken off or on, as occasion may require. The axle passing through the large wheels may revolve or not, as may suit best; or you may place boxes for the axle to run in under the floor of the locomotive engine, when more convenient. As a substitute for the locomotive engine, with a train of cars or carriages, going down hill, if it should be found necessary so to do, place stationary sheeves or circular knobs on or near the axle, for a rope to turn round on, or either or all of them: after having fastened the rope well at the bottom of the hill, then run it up to the top, and take a round turn over one or more of those knobs or sheeves that are fastened under the cars, carriages, or engine; when on the hill, hook the other end of the rope to a windlass placed there for the purpose of a regulator, keeping the rope taut. Or, if the rope is run round the windlass knobs or sheeves, and hooked or fastened to the cars or carriages, a boy of fifteen years of age can take them down with ease, and that without injury.

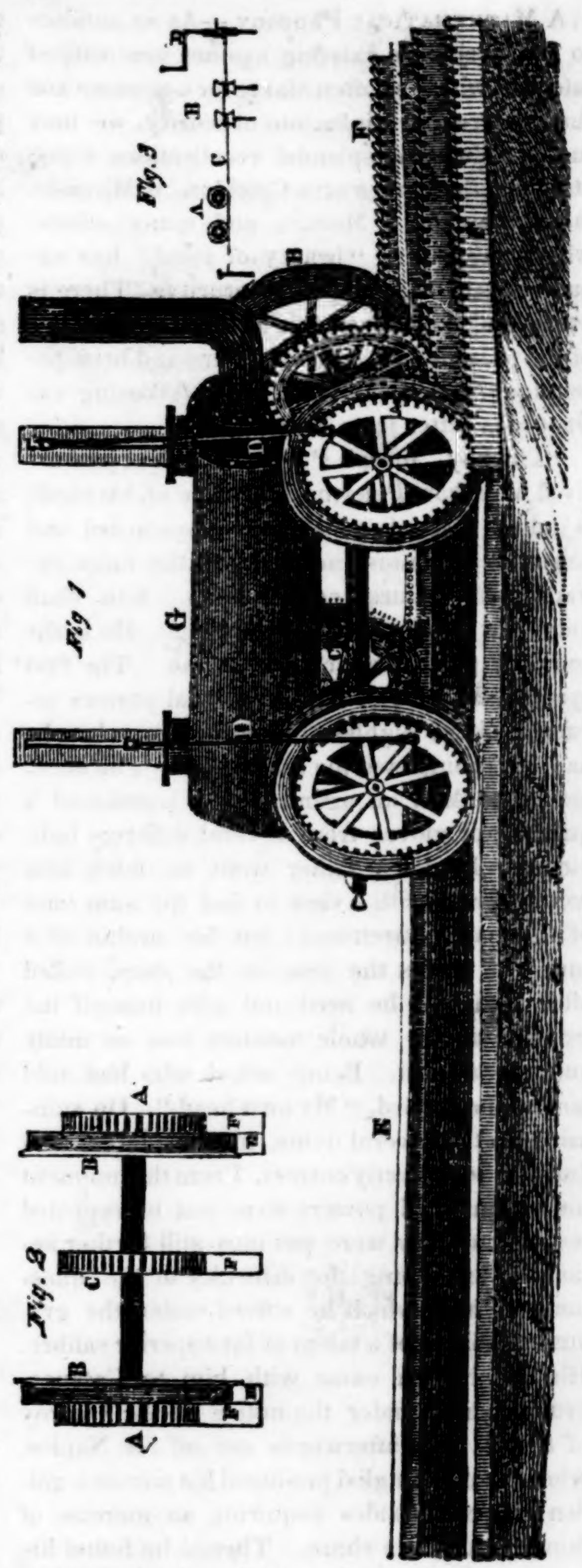
The power gained on this principle is double that of any former ones—it will ascend and descend Hills and Mountains, on inclined planes, at the most freezing and slippery season of the year. If this principle was adopted, thousands and tens of thousands of dollars might be saved, by preventing the necessity of levelling hills and rocks—a circumstance that deters many companies from being formed. The power gained on this principle is in proportion to the diameter of the small cogged wheels and the cranks that are on the axles, which turn the same. The Locomotive Engine may either run on the double or single rails cogged.

REFERENCES.

Fig. 1. A A, Segments or Wheels cogged—B B, Original or common Wheels—C C, Centre Wheel cogged—D, Body of the Engine—E, Centre Rail cogged—F F, Two outside rails cogged.

Fig. 2. Shewing the same as Fig. 1, in an erect position.

Fig. 3. Represents the apparatus for taking a train of carriages down hill, or on an inclined plane—A, Sheeves, stationary, on the axle or under the engine—B, Circular Knobs, stationary, at the top of the hill—C, Cord or Rope, or Chain—D, Windlass at the top of the hill—E, Post at the foot of the hill to fasten the rope or chain.



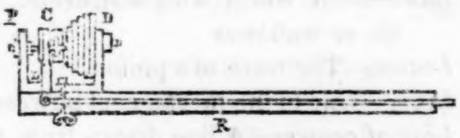
N. B.—If any thing should give way in going up or down hill, the Patentee has also a safety-guard, that will stop itself and the whole train of cars in an instant: the advantages of which will more fully appear by examining the model or drawing. Richard Berrian, Patentee.

New-York, 1832.

A Mathematical Prodigy.—As an antidote to the prejudice existing against precocity of intellect, which so often blazes for a moment and then expires, or sinks into obscurity, we may justly adduce the splendid recollections which attach to the names of a Crichton, a Mirandola, a Newton, a Mozart, and many others, whose premature "beauty of mind" has expanded into the happiest maturity. There is every such promise as this about a Sicilian boy of the present day, whose powers and brief parentage [!] are dwelt upon in the following extract of a letter from Rome:

"The boy, Joseph Puglisi, who has just arrived here from Palermo, the place of his birth, is indeed blessed, as all who have heard and observed him must admit, with the most extraordinary natural endowments. You shall judge for yourself of their extent. He is the son of a glove maker in Palermo. The first evidence he gave of his intellectual powers occurred about eighteen months ago, when he had just completed his sixth year. The occasion was this: an agent having purchased a quantity of gloves from several different individuals, Puglisi's father went to fetch him pen and ink, with a view to find the sum total of the man's purchases; but his urchin of a son, who was at the time in the shop, called after him that he need not give himself the trouble, as the whole amount was so many ounces and odd. Being asked who had told him so, he replied, "My own head." On summing up the several items, his calculation was found to be perfectly correct. From this moment his arithmetical powers were put to repeated tests; and they were put into still further action by increasing the difficulty of the questions set him, which he solved under the gradual exhibition of a talent of far superior calibre. His father then came with him to Catanea, brought him under the notice of the Viceroy of Sicily, and afterwards set off for Naples, where young Puglisi produced his parent a golden harvest, besides acquiring an increase of fame to his own share. Thence he found his way to this place, where he has been an object of astonishment and admiration in every circle, and has been honored with a handsome gold medal by the Pope himself. You can conceive nothing so astonishing as the boy's capacity for all sorts of arithmetical calculations, whether they be of the most trivial or the abstrusest nature. His genius consists in his being perfectly sensible of its pre-eminence, wielding it with masterly clearness and precision, and at times bringing it to bear with surprising effect. Hence it is, that he is enabled to state the process through which he arrives at once at his solutions, and, at the same time, to explain the difficulties which have attended them. All this is done without any aid from science; for, with the exception of a knowledge of figures, he can neither read nor write. For instance, on his being asked a particular question, it was necessary to explain what a square root was to him, and after that he instantly gave his answer with minute accuracy. I heard him in public yesterday: ten questions of various degrees of difficulty were set him, and he solved them all without hesitation or blunder. It was really a most interesting scene. The boy sat at first looking about him with a laugh and a smile, obviously flattered at being the subject of attention to so numerous an auditory; but no sooner was the first question started than his whole frame underwent a change as instantaneous as the sensitive plant, when the slightest touch affects it. Whilst brooding over it, he played with his hands, moved his body backwards and forwards, and was constantly shifting himself about on his seat. There was evidence irrefragable of every motion of the internal working of the '*mens alvina*.' On a sudden he sprang from his seat, in a state of indescribable ecstacy, and with eyes sparkling with fire, and exulting at his triumph, announced the result in a strong and melodious tone of voice. I must leave you to imagine the effect which all this produced upon us. And the same scene was repeated at every fresh question and solution. Two of them were stated in so confused a manner that not a soul in the room could comprehend them; at the second, the boy rose from his seat, and much to our diversion, exclaimed, with his broad good humored Sicilian, '*Lo saccio ben fare, ma essi non sanno domandare*,' (I am perfectly able to solve the thing, but they do not know how to put the question.) He was asked if a certain quantity of water be contained in the Tiber, and eight men were employed to remove it, how many days would they consume in the operation? Upon this the lad inquired, almost before the words were out of the questioner's mouth, 'You have

forgotten to state what quantity they bale out every day or hour.' As soon as the hiatus was supplied, in less than three minutes our young arithmetician stood up with the result, which involved some millions of figures. In person he is of middling size for his age, and between robust and slender of make; his complexion is sallow, his hair light-colored, and his eyes blue, though without any particular expression of liveliness or animation; his look, however, is soft, wary, and tranquil."—[Philadelphia Gazette.]



Improvement in the Lathe, by which the work in hand may be examined without stopping.

By J. Walker. [From the London Mechanics' Magazine.]

Sir,—In driving the foot lathe I have always found the hardest part of the labor to be the stopping occasionally to examine the work, and then starting anew. To obviate this difficulty I have invented the improvement represented in the accompanying sketch, which, as far as my knowledge extends, is new.

P shows the poppet head with riggers; D the dividing plate, fixed on the mandril with a small collar betwixt it and the riggers; C a small clutch box; L the lever; R a small rod supported at the far end of the bed, connected to C, which enables the turner to throw the riggers out and in gear; allowing them to run loose upon the mandril, so that when examining your work the fly wheel may still go on.

If any of your readers are aware of any similar contrivance, I should be glad to be made acquainted with it, as I am about fitting up a new turning apparatus with the improvement just described.

A GLOSSARY OF MECHANICAL TERMS.

[Continued from page 53.]

Eccentric—Deviating from the centre; as cambs, attached to the rim or circumference of a shaft for lifting forge hammers, stampers, &c.

Effective-head—The real head, or that which can be applied to practice.

Effluent—Flowing from; running out.

Efflux—The act of flowing out.

Epicycloid—The curve described in the air by a point on the circumference of a circle, when this circle rolls on another circle as its base.

Equilibrium—That peculiar state of rest in which a body is maintained by the force of gravitation, when the quantity of matter in it is exactly equal on each side of the bar or point on which it is supported.

Escapement—The part of a clock or watch movement which receives the force of the spring or weight to give motion to the pendulum or balance.

Face of the tooth—The curved part of a tooth which imparts impulse to another wheel.

Faggot—Pieces of iron bound together for remanufacture.

Fan—Small vanes or sails to receive the impulse of the wind, and, by a connexion with machinery, to keep the large sails of a smock wind-mill always in the direction of the wind; an instrument to winnow corn; also to decrease speed by its action on the air.

Female-screw—The spiral threaded cavity in which a screw operates.

File—A tool used by smiths for the abrasion of metals, denominated, according to its fineness, rough, bastard, or smooth.

First-mover—Power, either natural or artificial.

Flanch—An edge or projection for the better connexion of piping or castings of any description.

Flank of the tooth—The straight part of a tooth which receives impulse from another wheel.

Float—The board which receives the impulse of the water either in breast or undershot-wheels.

Floodgate—A strong framing of timber to pen back or let out water.

Flux—Ingredients put into a smelting furnace to fuse the ore of metals.

Fly-wheel—A heavy wheel to maintain equable motion.

Foot-brake—A machine used in the flax manufacture.

Forge—A manufactory in which metals are made malleable; a furnace.

Forge—To form by the hammer.

Friction—Inequality of surface; act of rubbing together.

Frisket—An iron frame used in printing to keep

the sheet of paper on the tympan, and to prevent the margin from being blackened.

Fulcrum—The point or bar on which a lever rests.

Geering—Part of mill-work.

Gibbet—That part of a crane which sustains the weight of goods.

Gig-mill—A mill in which the nap of woolen cloth is raised by the application of teasels.

Girder—The largest timber in a floor.

Girt—*Vide* Gripe.

Gravity—Tendency towards the centre of the earth ; weight.

Gripe—A pliable lever which can be pressed against a wheel to retard or stop its motion by friction.

Governor—A pair of heavy balls connected with machinery to regulate the speed on the principle of central force.

Gudgeon—The centres or pivots of a water-wheel.

Half-stuff—This term, in general, implies any thing half-formed in the process of the manufacture.

Heald or Heddle—*Vide* Heddle.

Heckle—A metal comb for the manufacture of flax.

Heddle—That portion of a loom which imparts motion to the warp of a web during the process of manufacture.

Helve—The shaft of a forge or tilt-hammer.

Hopper—A funnel in which grain is deposited, whence it runs between the stones of a flour-mill.

Horology—The art of constructing machines for measuring time.

Hydraulics—The science which treats of the motion of fluids, of the resistance which they oppose to moving bodies, and of the various machines in which fluids are the principal agent.

Hydrodynamics—The science which embraces the phenomena exhibited by water and other fluids, whether they be at rest or in motion : it is generally divided into two heads, hydrostatics and hydraulics.

Hydrostatics—The science which considers the pressure, equilibrium, and cohesion of fluids.

Impact—Transmission of force.

Impinge—To dash against.

Inertia—That tendency which every piece of matter has, when at rest, to remain at rest ; and when in motion, to continue that motion.

In vacuo—Empty space, void.

Isochronal—Of equal duration.

Isochronous—The vibrations of a pendulum.

Jenney—A machine used in the process of the cotton manufacture.

Jib—*Vide* Gibbet.

Kiln—A place where bricks are burnt.

Kink or Kinkle—The entangling of cordage from overtwisting.

Lateral—A horizontal or lengthwise movement.

Lathe—Machine used by turners.

Lantern—A wheel with staff-teeth ; the trundle or wallower.

Leaves—The teeth of a pinion.

Lever—One of the mechanical powers.

Line of centres—A line drawn from the centre of one wheel to the centre of another, when their circumferences touch each other.

Locomotive—The power of changing place.

Loom—A machine used by weavers in the making of cloth.

Machinist—One who makes machines.

Mandrel—Part of a lathe ; cone used by smiths ; a cylindrical piece of polished iron or steel put down the core or hole of a pipe during the process of elongation.

Mastering—Preparation of lime used by tanners.

Matrice—The concave form of a letter in which the types are cast.

Maximum—Is the utmost extent of any movement or power.

Mechanist—One acquainted with the laws of mechanics.

Mill-head—The head of water which is to turn a mill.

Mill-tail—The water which has passed through the wheel-race, or is below the mill.

Minimum—The reverse of maximum.

Momentum—The force possessed by matter in motion.

Monkey—A weight or mass of iron let fall from a height to drive piles into the earth.

Mortise—A joint.

Movement—The working part of a watch or clock.

Nave—The centre, or that part of a wheel in which the spokes or arms are fixed.

Nealing—*Vide* Annealing.

Nippers—Pincers with cutting edges for dividing metals.

Nitric acid—A corrosive acid extracted from nitre.

Ouse—Preparation of bark used by tanners.

Overshot-wheel—A wheel which receives the water in buckets at not more than 45 degrees from the apex.

Oxyd—A combination of oxygen with a metallic or other base.

Oxygen—A gas which supports combustion.

Paddle—A kind of oar; floats to a wheel.

Pall—A small piece of metal which falls between the teeth of a ratchet-wheel, to prevent a load which has been raised from descending when the operative power is removed.

Pallet—That part of a watch or clock escapement on which the crown-wheel strikes.

Pendulum—A weight suspended by a flexible cord to an axis, so as to swing backwards and forwards, when once raised, by the force of gravitation.

Periphery—The circumference of a wheel.

Perpendicular—At right angles to a given base.

Pick—A chisel for dressing the stones of a flour-mill.

Pile—A large piece of timber, pointed at one end, to drive into the earth to sustain the piers of bridges, &c.

Pin—To strike a piece of metal with the narrow end of a hammer to form dents and produce elongation.

Pincers—A tool formed by placing two levers on one fulcrum, regulated by a screw-movement, for holding bodies firmly.

Pinion—A small toothed wheel.

Pirn—The wound yarn that is on a weaver's shuttle.

Piston—A plug made to fit tight and work up and down a cylinder in hydraulic engines.

Pitch-lines—The touching circumference of two wheels which are to act on each other.

Pitch of the wheel—The distance from the centres of two teeth, measured upon their pitch line.

Pivot—A short shaft on which a body turns or vibrates.

Platina—A white metal capable of withstanding great heats.

Pliers—A small tool constructed similarly to pincers.

Plumb—A leaden weight suspended by a cord to ascertain the perpendicular.

Plunger—A body that is forced into a fluid in hydraulic engines, to displace its own weight.

Portable steam-engine—A steam-engine built in a compact form, and not attached to the wall of the building in which it works.

Proportional circles—*Vide* Pitch-lines.

Proportional radii—The radii of two circles whose circumferences are in contact.

Pudding—The act of ramming with clay to arrest the progress of water.

Pudding-furnace—A furnace used in the iron manufactures.

Pulley—A small wheel over which a strap is passed.

Quintal—A French or Spanish weight equivalent to 100 lbs. of those respective nations.

Rabbit or Rap-it—The strong wooden spring against which the forge hammer strikes on its ascent.

Race—The canal along which the water is conveyed to and from a water-wheel.

Rack—A straight bar which has teeth similar to those on a toothed wheel.

Radii—The plural of radius.

Radius—The semi-diameter of a circle; the arm or spoke of a wheel.

Rasp—A species of file, on which the cutting prominences are distinct, being raised by a point instead of an edge.

Rasure—The act of scraping.

Ratch—A bar containing teeth into which the pall drops to prevent machine running back.

Ratchet-wheel—A wheel having teeth similar to those of a ratch.

Reciprocating—Acting alternately.

Rectilinear or rectilineal—Consisting of right lines.

Reed—Part of a loom, resembling a comb, for dividing the warp.

Regulator—A small lever in watch-work, which, by being moved, increases or decreases the amount of the balance spring that is allowed to act.

Reel—A frame on which yarn may be wound.

Reeling—The act of winding yarn on a reel.

Resolution of forces—*Vide* "Of the Action of Forces."

Reservoir—A large basin or conservatory of water.

Reverberatory—Beating back.

Reverberatory-furnace—A furnace used in the iron and copper manufactures.

Rivet—To form a head by the percussion of a hammer, to prevent a piece of metal which has been passed through an orifice, to connect things together, from returning.

Roller-gin—A machine to divest cotton of the husk and other superfluous parts, previous to the commencement of the manufacture.

Rotatory—Revolving.

Rowans—Cotton in that part of the manufacture before it goes to the roving frame.

Rubber—A heavy file used for coarse work.

Rubble—A mode of building;]*vide* Masonry, p. 98, vol. ii, of Nicholson's Op. Mec.]

Rynd—The piece of iron that goes across the hole in an upper mill-stone.

Safety-valve—A valve which fits on the boiler of a steam-engine to guard against accidents by the steam obtaining too high a pressure.

Saw-gin—A machine on the principle of the roller-gin.

Scantling—The length, breadth, and thickness of any solid body taken lineally.

Scapement—*Vide* Escapement.

Scotching—The operation of packing hemp before it goes to the market.

Scoria—Slag from a smelting furnace.

Scowering-barrel—An octagonal, or other shaped barrel, in which scrap-iron, &c. is cleansed from rust by friction as it revolves.

Scrap-iron—Various pieces of old iron to be remanufactured.

Screw—One of the mechanical powers.

Screbbler-engine—An engine used in the process of the cotton manufacture.

Shaft—A long piece of wood, or metal, on which large wheels are fixed in mill-work.

Sheeve—A small kind of pulley.

Shoulder—A support by means of a projection from a surface.

Shrouding—The boards, &c. which form buckets of water-wheels.

Shuttle—An arrangement to allow or shut off water from a water-wheel; a small piece of wood which carries the thread in weaving.

Size—Gelatinous matter made from animal or vegetable substances, and applied to fibrous materials to impart stiffness.

Slag—Scoria, or refuse from an iron furnace.

Sledge-hammer—A heavy hammer, used by a smith with both hands.

Slip—Potter's clay of the requisite consistency.

Sluice—Vent for water; a kind of flood-gate.

Snail movement—An eccentric.

Solder—Various compounds of metals for conjoining other metals that are less fusible than such compound.

Sparables—From sparrow-bill, small nails to drive into shoes.

Spatala—A thin knife, used mostly to extend superficially some semi-fluid matter.

Spindle—A thin piece of wood or steel on which yarn is wound after it has been twisted; a small kind of shaft.

Spokes—The radial pieces which connect the periphery of a wheel with its centre-piece or nave: this term is only applied to carriages.

Spring—An elastic body formed of metal or wood.

Spring-arbor—The arbor or spring round which the main spring of a watch is wound.

Spring-box—The box which contains the main spring.

Spur-geer—Wheels whose axes are parallel to each other.

Splice—To conjoin lengthwise two flexible pieces: by the interposition of their respective parts, so as to maintain them in conjunction by friction.

Staff—The teeth of a trundle, lantern, or wallower.

Staking-on—To drive wedges in the bush of a wheel or pulley, to fix it firm on a shaft or spindle.

Start or strut—The partitions which determine the form of a bucket in an over-shot wheel; the shoulder or wrest.

Staves—The plural of staff.

Steam-boat—A boat moved by steam power.

Steam-engine—A machine for applying the force of steam to create motion.

Steel-yard—A machine which denotes the weight of bodies by placing them at different distances from its fulcrum.

Stereotype—The art of casting solid plates from moveable types, to print from.

Strike—A thing used to strike any thing level in a measure; the strickle.

Strata—The plural of stratum.

Stratum—A single layer or bed of any one thing.

Stuff—This term is applied to an infinite variety of things; wood is, by the carpenter, called stuff, so is lime and hair by the bricklayer, and plaster by the plasterer, &c.

Swag—An unequal or hobbling motion.
Swifts—The rapid movement in a carding machine.
Swingling—*Vide* Scotching.
Swing-tree—Any beam that vibrates.
Swivel—A thing fixed in another body to turn round upon.
Syphon—A bent tube with unequal legs, through which a fluid will flow by the force of gravity.
Tail-water—Water which impedes the water-wheel in mill work.
Tank—Reservoir for water, &c.
Teasels—Thistles used to raise the nap of cloth in the gig-mill.
Tenon—That part which fills up the mortise.
Tilt-hammer—A hammer lifted by machinery, to force iron or steel.
Treadle—A lever affixed to a crank which communicates motion to machinery by a foot movement.
Throwsting—Spinning.
Triblet—*Vide* Mandrel.
Truckles—Small rollers for diminishing friction.
Trundle—A small wheel with staff teeth; the lantern or wallower.
Tuyere or Tue-iron—An orifice through which a blast or strong current of air is passed into forges.
Tympan—That part of a printing-press on which the paper is laid to receive the impression.
Undershot-weeel—A wheel acted on by water below its centre.
Vacuum—Void of air.
Valve—A cover to an aperture, in hydraulic machines, to prevent fluids taking a wrong course.
Vane—A flat surface capable of being moved by the current of a fluid; as, for instance, the vanes of a wind-mill, moved by the wind.
Tappets—Projections on the plug-tree of a steam-engine, which open and shut the valves at proper intervals.
Varnish—A solution of certain resinous bodies in spirits or oils, which assumes a solid form on dissication.
Velocity—The measure of quickness with which a body moves.
Vertical—Perpendicular to the horizon.
Vibration—Rapid alternating motion.
Virtual head—The real or effective head.
Vis-inertia—*Vide* Inertia.
Wabble—A hobbling unequal motion.
Wallower—Small wheel with staff teeth; the trundle or lantern.
Warp—The layer of threads which extends the length of the piece to be woven.
Washers—Small pieces of metal placed under a nut to reduce friction.
Water-wheel—A wheel which receives its impulse from water.
Weathering—The angle at which the sails of a wind-mill are set, to receive the impulse of the wind.
Wedge—An angularly shaped piece of wood or metal; one of the mechanical powers.
Weft—*Vide* Woof.
Weight—The measure of the amount of the attraction of gravitation in any body compared with that of other bodies.
Welding—The property of a conjunction possessed by some metals at high temperatures.
Wheel and Axis—One of the mechanical powers.
Wheel-race—The place in which a water-wheel is fixed.
Whip—To bind two rods together with small twine; the length of the sail of a wind-mill measured from the axis.
Whirl—A rotatory motion with a decreasing speed.
Winch—The lever or handle to which force is applied in machines turned by manual labor.
Wiper—An eccentric.
Wire-draw—To reduce any longitudinal body exceedingly in the transverse section; rapid passage of a fluid through a conical orifice.
Woof—Those portions of thread or yarn in cloth, which lie across the length of the warp.
Wrest or Wrist—The partitions which determine the form of the bucket in an overshot wheel; the start or shoulder.
Yarn—The combination of fibrous materials into a linear form by torsion.

A MILLION OF FACTS—*By Sir Richard Phillips.*—Among the clever books recently received from London, is one with the above title, containing a vast variety of information in a small space. It has been announced for publication by Mr. Conner, of New-York.

The sea is to the land, in round millions of square miles, as 160 to 40, or as 4 to 1.

Fraimhoifer, in his optical experiments, made a machine in which he could draw 32,900 lines in an inch breadth.

There are 7,700 veins in an inch of colored mother-of-pearl. Iris ornaments of all colors are made by lines of steel from 200 to the $\frac{1}{1000}$ part of an inch.

Bodies are transparent, says Newton, when the pores are so small as to prevent reflection.

The apprehension of the failure of a supply of coals in England is delusion. In Yorkshire alone, there are exhaustless beds, which are sold at 4s. or 5s. per ton.

The coal mines, which in Staffordshire have been burning for 200 years, consist of pyrites, subject to spontaneous combustion. Water will not extinguish them, because when drawn off, or absorbed, the pyrites burn more than before.

The odorous matter of flowers is inflammable, and arises from an essential oil. When growing in the dark their odor is diminished, but restored in the light; and it is strongest in sunny climates.

A chesnut tree grew at Tamworth, which was 52 feet round; it was planted in the year 800; and in the reign of Stephen, in 1135, was made a boundary, and called the great chesnut tree. In 1759, it bore nuts which produced young trees.

Botanists record 56,000 species of various plants; and 38,000 are to be found in the catalogues.

The height of mountains in the moon is considerable; ten are five miles or nearly; and eight are from 3 to 4 miles. Three of the hollows are from 3 to 4 miles; ten are from 2 to 3 miles, and as many are nearly 2 miles.

Teeth are phosphate of lime and cartilage, but the enamel is without cartilage.

The muscles of the human jaw exert a force of 534 pounds, and those of mastiffs, wolves, &c. far more. The force is produced by the swelling of the muscles in the middle, and dilating again.

The number of ribs vary, being twelve or thirteen on a side.

Peculiar Method of Turning Wool into Fur.—The wool-growers of Podolia and the Ukraine, and also in the Asiatic province of Astrachan, have a peculiar method of turning wool into fur. The lamb, after a fortnight's growth, is taken from the ewe, nourished with milk and the best herbage, and wrapped up as tight as possible in a linen covering, which is daily moistened with warm water, and is occasionally enlarged as the animal increases in size. In this manner wool becomes soft and curly, and is by degrees changed into shining beautiful locks. This is the kind of fur which passes under the name of Astrachan, and is considered on the continent as the most genteel lining in winter cloaks. Similar trials with German sheep have been attended with the same success. The Saxon breed of sheep have, within the last ten years, superceded the merino, and their wool is of superior quality.

New Electro-Magnetic Experiment.—Professor Emmet, of the University of Virginia, has succeeded in so arranging the horse-shoe magnet as to enable him to obtain, at pleasure, brilliant scintillations, nearly as perfect as those produced by the flint and steel. The most remarkable discovery, however, is a sure mode of giving strong and even unpleasant shocks, which bear great resemblance to those from a voltalic pile of about 100 pairs of plates. Some other results, tending to show that this new force has properties intermediate between those of Electricity and Galvanism, have been obtained and will shortly be made public.—[National Gazette.]

Cotton Manufactures in the State of New-York.—The following statement was furnished to the American Advocate by Mr. Williams, Editor of the N. Y. Annual Register, and one of the Committee appointed by the late Tariff Convention to ascertain the facts here presented:

There are in the State of New-York, 112 Cotton Manufactories.

Amount of capital invested, $4,485,500.

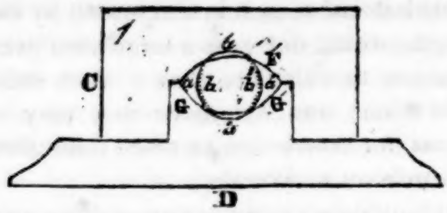
Goods manufactured yearly, valued 3,530,250.

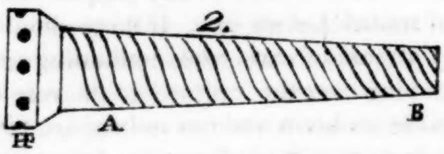
Amount of cotton used annually, 7,961,670 lbs. Equal to 26,539 bales of 300 lbs. each.

Number of spindles in use, 157,316.

Number of persons employed and sustained by said establishments, 15,817.

[Jour. of Com.]





New Modification of the Power of the Screw. By Φ. M. [From the London Mechanics' Magazine.]

The printer has made an erroneous substitution of "*c* 200 and *d* 200" for "*c* 201 and *d* 200," in the article describing my proposed improvement of Hunter's screw-press, which has, I fear, rendered that article somewhat unintelligible. Before I proceed to notice the figures above, I beg to remind those who may take the trouble to read the article alluded to, that, as I stated, the construction given is not the best of several; I have one in reserve, which meets two capital objections, which I anticipated as likely to be urged against the practical utility of the improvement—one, the great apparent increase of friction, the other the danger of the square production of the screw twisting under a very severe strain. I beg to add further, that I estimate the power of the press, according to the data given, at upwards of 20,000 tons.

The prefixed figures represent what, I believe, is quite a new modification of the power of the screw; and one which will produce a greater amount of power, at less expense of friction, and with less complexity of construction, than any other. As the common screw is familiarly considered as a wedge applied to the circumference of a cylinder, so this may be viewed as a wedge applied to the circumference of a frustum of a cone, and may be called a conic or wedge-screw. AB is such a screw, tapering from A to B, and having precisely the same interval between all the turns of the thread. The head is furnished with holes for handspokes to work the screw with. CD is the nut, formed in two parts, which separate easily. The eye of the nut is a frustum of a hollow cone, accurately similar to the smaller extremity of the screw, as far as regards the angular inclination of the sides of each to their respective axes, as seen in a longitudinal section; but different in this, that when the screw is inserted into the nut, the former is only a tangent to the latter. When the screw is inserted and worked round, it gradually forces the parts of the nuts asunder until the thicker end has come between them, when the surfaces of the nut and screw must be found to coincide.

In the figure the arcs F F′ and G G′ are arcs of a sectional circumference of the thickest part of the screw. A section of the smaller end is seen as inserted in the nut; the dotted circle *b b*′ is a section of the body of the screw, and the outer circle, *a a*′, &c. is one of the threads of the screw, partly seen, and partly hid by its engagement in the nut. This screw seems equal to any thing, either as a producer of force, or as a measurer of minute distances: it seems also to have this peculiar advantage, that the smaller the angle of inclination of the sides, viz. the greater the power exerted, the more the threads are relieved from the burden of the pressure. As a mover of weight, the following estimate may be made of its power:—

Taking the length of the screw at 3 feet, independent of what enters the nut before action, the number of threads in that length as 30, the distance from the centre of the head to the end of the handspoke at 4 feet, and the difference of the diameters of the greater and less ends at 1 inch, then the resultant power will be about 259,500 lbs. or upwards of 115 tons, taking the working-power at 30 lbs.

As a micrometer, I beg to add the following estimate of its performance:—

Taking the length of a quarter degree on a common seaman's quadrant at $\frac{1}{20}$ of an inch, the length of the conic screw at 1 inch, the difference of the sectional diameters of the ends of the screw, and $\frac{1}{20}$ of an inch, and supposing the head of the screw to be divided into 100 parts on its limb; then we shall have a degree divided to the $\frac{1}{8000}$th part, or into less than half-seconds, supposing the thread to make 20 turns in the inch.

Earthquakes.—Among the novelties of the times, says the London Correspondent of the Journal of Commerce, are to be included some severe shocks of an earthquake felt at Swansea, and the surrounding country, to the distance of thirty miles. There were three shocks, the first having occurred on 28th December. This

was rather slight, and principally felt towards the coast. The second occurred on the following day, early in the morning, and was felt by every person either asleep or awake.

The third excited considerable alarm, and took place about 8 o'clock on the subsequent morning. The bells rung in many of the churches and houses—chimnies were thrown down—walls gave way—several houses opened, from their roofs to the ground, nearly an inch in width—many sunk from two to four feet, and all vibrated in such a manner that their fall was momentarily expected. It lasted almost four seconds, and was accompanied by a sound which is described to have been 'truly terrific.'

You will no doubt remember that when the great earthquake destroyed Lisbon in 1775, the Swansea river presented most striking phenomena. Perhaps these shocks are dependent upon some dreadful catastrophe, at a distance, and which time alone will enable us to ascertain. In this instance it was followed by a gale, which proved destructive to several vessels; one was seen to disappear, though a moment previously it was observed gliding rapidly over a slight sea. Many families have left Swansea, fearful that a more serious earthquake will take place, and those who have been compelled to remain are described as suffering very much from dread.

Railroads for the Application of Human Power. By Publicola. [From the American Railroad Journal, &c.]

The force of traction necessary to propel a ton weight on a level railroad is about eight pounds; or, in other words, a man can propel a ton weight on a level railroad as easily as he can walk on that road, and draw up eight pounds over a pulley. To surmount an ascent 66 feet in a mile would require in addition the force necessary to raise 28 pounds over a pulley. But as we know better how much a man may actually draw on a common road, the proposition may be stated thus: that a man may propel one ton on a level railroad as easily as he can draw 112 lb. on a common road. It will not be extravagant then to assume that a man may propel one ton weight on such railroads as it would be practicable to make in our country. To make a railroad with the tracks but 3½ feet apart, sufficiently strong to sustain cars holding but one ton each, and moved by human strength, would not cost a large sum per mile. I venture to calculate that if such railroads should come into extensive use, they would not cost for double tracks more than 2000 dollars a mile on an average.

But would they answer any purpose as channels of trade? Let us see. If there should be a steady stream of cars, each containing one ton, and moving over the railroad at the rate of but two miles an hour, and ten rods apart, 600 tons might pass over in ten hours, and then, excepting the sabbaths, at this rate 187,800 tons might pass over in a year; and on the supposition that a large city has ten such routes entering it from the country, 1,878,000 tons might come to market on such channels of trade during the year. But the tonnage, domestic and foreign, that departed from the whole United States in 1826, was 1,052,429. Supposing that one-tenth of this departed from Boston, one slight railroad, sufficient for a man to move one ton weight upon it at a time in a car, would convey all its merchandize; and two such railroads would convey to New-York all the goods it would export.

If, however, such railroads would be altogether insufficient for large cities, they might be channels of communication between villages in the country, and from small districts of country to great roads.

Where there is business enough to employ sufficiently a very large capital, invested in heavy railroads, and powerful steam carriage, steam will be found a cheaper power than human strength; but there is a vastly greater amount of capital required for such purposes, and yet the conveyance cannot be indefinitely extended: it must be limited by the population and resources of the country.

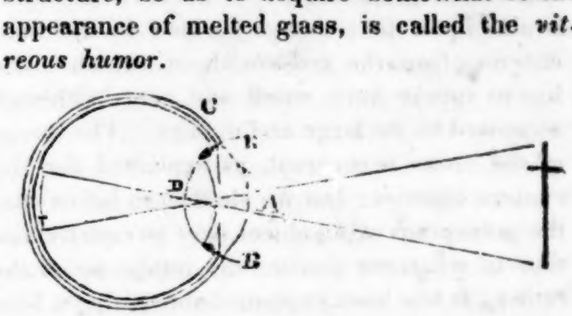
The cost of a road that shall every where, over vallies and rivers, be strong enough to sustain the weight and movements of a car of ten tons weight, must be about ten times as great as the cost of a road that shall have to sustain at one point but a ton weight.

We should think it absurd to have a huge, heavy pipe, of a foot diameter, to convey water in occasional gushes, when an inch pipe would convey all the water we should desire or could procure, and just as we should need it too. But if some railroads of gigantic dimensions are to traverse the country, let the trial be

made, by those who have resources to make the experiment, whether narrow railroads for the application of human strength might not be made that would greatly facilitate communication between different sections of the interior; and that would be to the great railroads, what the little rills and streams are to the Ohio, the Mississippi, and Missouri. Every judicious speculator will wish that his plans may, if possible, be fairly tested by experiment; and tested in this way by those who are able to do it without hazarding losses which they cannot safely bear. The plan here suggested is one that can easily be brought to the test of experiment. If, on a railroad, for half a mile in extent, a man can move a load of a ton weight at the average speed of but two miles, then it will be established that such railroads will be economical, and most convenient lines of conveyance over all the country, and especially to those great railroads where steam machinery works cheaper than men's limbs can do.

On the Human Eye—Description of its Structure, &c. [From Dr. Arnott's Elements of Physics.]

The *human eye* is a globular chamber of the size of a large walnut, formed externally by a very tough membrane called, from its hardness, the *sclerotic coat*, in the front of which there is one round opening or window, named, because of its horny texture, the *cornea*. The chamber is lined with a finer membrane or web—the *choroid*, which, to ensure the internal darkness of the place, is covered with a black paint, the *pigmentum nigrum*. This lining at the edge of the round window is bordered by a folded drapery—the *ciliary processes*, hidden from without by being behind the curious contractile window curtain, the *iris*, through the central opening of which, or *pupil*, the light enters. Immediately behind the pupil is suspended by attachments among the ciliary processes, the *crystalline lens*, a double convex most transparent body of considerable hardness, which so influences the light passing through it from external objects as to form most perfect images of these objects in the way already described, on the back wall of the eye, over which the optic nerve, then called the *retina*, is spread as a second lining. The eye is maintained in its globular condition by a watery liquid, which distends its external coverings, and which in the compartment before the lens, or *the anterior chamber of the eye*, being perfectly limpid, is called the *aqueous humor*, and in the remainder or larger *posterior chamber*, being inclosed in a transparent spongy structure, so as to acquire somewhat of the appearance of melted glass, is called the *vitreous humor*.



The annexed figure represents an eye of the common dimensions, supposed to be cut through the middle downwards. C is the outer or *sclerotic coat*, known popularly, where most exposed in front, as the *white of the eye*. A is the transparent cornea joined to the edge of the round opening of the sclerotic: it is more bulging than the sclerotic, or forms a portion of a smaller sphere than the general eye-ball, so that while it may be truly called a *bow window*, it, or rather the convex surface of its contained water, is also a powerful lens for acting on the pencils of entering light. At B, and similarly all around the edge of the cornea, is attached the window curtain or *iris*, shown here edgeways, immersed in the aqueous humor, and hanging inwards from above and below towards its central opening or *pupil*, through which the rays of light are passing to the lens. The iris has in its structure two sets of fibres, the circular and the radiating, which cross and act in opposition to each other. When the circular fibres contract, the pupil is lessened; when the radiating contract, it is enlarged: and the changes happen according to the intensity of light and the state of sensibility of the retina,—as may at any time be proved by closing the eye-lids for a moment to make the pupil dilate, and then opening them towards a strong light, to make it contract. Behind the pupil is seen the *lens* D with its circumference attached to the *ciliary processes* E: it is more convex behind than before. The disease of the eye, called *cataract*, (from a Greek word implying *obstruction*,) is the circumstance of the lens becoming opaque, and the cure is to extract the lens entirely, or to depress it to the bottom of the eye, and then to

substitute for it externally a powerful artificial lens or spectacle-glass. The three lines, forming here the boundary of the eye, stand for its three coats, as they have been called, the strong *sclerotic*, and the double lining of the *choroid* and *retina*. The figure of a cross is represented upon the retina as formed by the light entering from the cross without, which cross has to appear here small and near, although supposed to be large and distant. The image of the cross is inverted, as explained for the camera obscura: but we shall learn below that the perception of an object may be equally distinct in whatever position the image be on the retina. It has been explained above, that a lens can form a perfect image of considerable extent only on a concave surface, and the retina is such a surface. The present diagram farther explains what is meant by the *anterior* and *posterior chambers* of the eye, viz. the compartments which are before and behind the crystalline lens D.

The nature of the eye as a camera obscura is beautifully exhibited by taking the eye of a recently killed bullock, and after carefully cutting away or thinning the outer coat of it behind, by going with it to a dark place and directing the pupil towards any brightly illuminated objects; then, through the semi-transparent retina left at the back of the eye, may be seen a minute but perfect picture of all such objects—a picture, therefore, formed on the back of the little apartment or camera obscura, by the agency of the convex cornea and lens in front.

Understanding from all this, that when a man is engaged in what is called looking at an object, his mind is in truth only taking cognizance of the picture or impression made on his retina, it excites admiration in us to think of the exquisite delicacy of texture and of sensibility which the retina must possess, that there may be the perfect perception which really occurs of even the separate parts of the minute images there formed. A whole printed sheet of newspaper, for instance, may be represented on the retina on less surface than that of a finger nail, and yet, not only shall every word and letter be separately perceivable, but even any imperfection of a single letter. Or, more wonderful still, when at night an eye is turned up to the blue vault of heaven, there is pourtrayed on the little concave of the retina the boundless concave of the sky, with every object in its just proportions. There a moon in beautiful miniature may be sailing among her white edged clouds, and surrounded by a thousand twinkling stars, so that to an animalcule supposed to be within and near the pupil, the retina might appear another starry firmament with all its glory. If the images in the human eye be thus minute, what must they be in the little eye of a canary bird, or of another animal smaller still! How wonderful are the works of Nature!

Natural Wonders.—It is very surprising that two of the greatest natural curiosities in the world are within the United States, and yet scarcely known to the best informed of geographers and naturalists. The one is a beautiful water-fall in Franklin county, Georgia; the other a stupendous precipice in Pendleton district, South Carolina: they are both faintly mentioned in the late edition of Morse's Geography; but not as they merit. The Tuccoa falls are much higher than the falls of Niagara. The column of water is propelled beautifully over a perpendicular rock, and when the stream is full it passes down without being broken. All the prismatic effect seen at Niagara illustrates the spray of Tuccoa. The Table Mountain in Pendleton district, South Carolina, is an awful precipice of 900 feet. Many persons reside within five, seven, or ten miles of this grand spectacle, who have never had curiosity or taste enough to visit it. It is now, however, occasionally visited by curious travellers, and sometimes men of science. Very few persons who have once cast a glimpse in the almost boundless abyss can again exercise sufficient fortitude to approach the margin of the chasm. Almost every one, in looking over, involuntarily falls to the ground, senseless, nerveless, and helpless; and would inevitably be precipitated and dashed to atoms, were it not for measures of caution and security, that have always been deemed indispensable to a safe indulgence of the curiosity of the visitor or spectator. Every one, on proceeding to the spot whence it is usual to gaze over the wonderful deep, has, in his imagination, a limitation, graduated by a reference to instances with which his eye has been familiar. But in a moment, eternity, as it were, is presented to his astonished senses; and he is instantly over-

whelmed. His system is no longer subject to his volition or his reason, and he falls like a mass of pure water. He then revives, and in a wild delirium surveys a scene which, for a while, he is unable to define by description or imitation.

How strange is it that the Tuccoa Falls and Table Mountain are not more familiar to Americans! Either of them would distinguish an empire or state in Europe.

Formation of Character.—A taste for useful reading is an effectual preservative from vice. Next to the fear of God implanted in the heart, nothing is a better safeguard than the love of good books. They are the hand-maids of virtue and religion. They quicken our sense of duty, unfold our responsibilities, strengthen our principles, confirm our habits, inspire in us the love of what is right and useful, and teach us to look with disgust upon what is low, and grovelling, and vicious. It is with good books as it is with prayer; the use of them will either make us leave off sinning, or leave off reading them. No vicious man has a fondness for reading. And no man who has a fondness for this exercise is in much danger of becoming vicious. He is secured from a thousand temptations to which he would otherwise be exposed. He has no inducement to squander away his time in vain amusements, in the haunts of dissipation, or in the corrupting intercourse of bad company. He has a higher and nobler source of enjoyment to which he can have access. *He can be happy alone;* and is indeed never less alone, than when alone. Then he enjoys the sweetest, the purest, the most improving society, the society of the wise, the great, and the good; and while he holds delightful converse with these, his companions and friends, he grows into a likeness to them, and learns to look down, as from an eminence of purity and light, upon the low-born pleasures of the dissipated and profligate.

The high value of mental cultivation is another weighty motive for giving attendance to reading. What is it that mainly distinguishes a man from a brute? Knowledge. What makes the vast difference there is between savage and civilized nations? Knowledge. What forms the principal difference between men as they appear in the same society? Knowledge. What raised Franklin from the humble station of a printer's boy to the first honors of his country? Knowledge. What took Sherman from his shoemaker's bench, gave him a seat in Congress, and there made his voice to be heard among the wisest and best of his compeers? Knowledge. What raised Simpson from the weaver's loom, to a place among the first of mathematicians; and Herschel, from being a poor fifer's boy in the army, to a station among the first of astronomers? Knowledge. Knowledge is power. It is the philosopher's stone—the true alchemy that turns every thing it touches into gold. It is the sceptre that gives us our dominion over nature: the key that unlocks the store of creation, and opens to us the treasures of the universe.

Speaking Heads.—Next to the eye, the ear is the most fertile source of our illusions, and the ancient magicians seem to have been very successful in turning to their purposes the doctrines of sound. The principal pieces of acoustic mechanism used by the ancients were *speaking* or *singing heads*, which were constructed for the purpose of representing the gods, or of uttering oracular responses. Among these, the speaking head of Orpheus, which uttered its responses at Lesbos, is one of the most famous. It was celebrated, not only throughout Greece, but even Persia, and it had the credit of predicting, in the equivocal language of the heathen oracles, the bloody death which terminated the expedition of Cyrus the Great into Scythia. Oden, the mighty magician of the North, who imported into Scandinavia the magical arts of the East, possessed a speaking head, said to be of the sage Minos, which he had encased in gold, and which uttered responses that had all the authority of divine revelation. The celebrated Gerbert, who filled the Papal Chair, A. D. 1000, under the name of Sylvester II, constructed a speaking head of brass. Albertus Magnus is said to have executed a head in the thirteenth century, which not only moved but spoke. It was made of earthen ware, and Thomas Aquinas is said to have been so terrified when he saw it, that he broke it in pieces, upon which the mechanist exclaimed, "these, Gods! the labor of thirty years."—Dr. Brewster supposes, that the sound was conveyed to these machines by pipes from a person in another apartment to the mouth of the figure.—[Sir D. Brewster's Letters on Natural Magic.]

An Extraordinary Jargonelle Pear. By Mr. M. Saul. [From the New-York Farmer and American Gardener's Magazine.]

Sir,—The pear, of which the following is a drawing, was grown in this town this season. The one at the stem was first formed; it then sent out a blossom, which produced the second; this produced two blossom buds, from which were grown the two smaller ones. I have an account of a similar production of a pear, grown in another place. There were six well formed pears.

Lancaster, England, October, 1832.

Chemical Amusements.—*Sympathetic Ink.*—Write with a diluted solution of muriate of copper, and the writing will be invisible when cold; but when held to the fire it will appear of a yellow color.

2. Write with a diluted solution of muriate or nitrate of cobalt, and the writing will be invisible; but, upon being held to the fire, it will appear perfectly distinct, and of a blue color; if the cobalt should be adulterated with iron, the writing will appear of a green color; when taken from the fire, the writing will again disappear. If a landscape be drawn and all finished with common colors, except the leaves of the trees, the grass and the sky, and the latter be finished with this sympathetic ink, and the two former with the adulterated solution just mentioned, the drawing will seem to be unfinished, and have a wintry appearance; but upon being held to the fire, the grass and the trees will become green, the sky blue, and the whole assume a rich and beautiful appearance.

This landscape will, at any time, exhibit the same appearance.—[Delaware Free Press.]

On the Probable Application of Steam Power to Various Purposes.—It is not improbable, that in nothing will greater changes be effected before the close of the year which has just commenced, than in the purposes to which this tremendous agent will be applied. Every day brings to light some new form in which its irresistible energies may be employed. Ten years ago, the idea of substituting a steam engine for a horse, as propelling power upon a turnpike, would have been thought chimerical; and the projector who should have talked of travelling from New-York to Philadelphia and back again between sunrise and sunset, would have found his schemes listened to with most ominous shakes of the head and shrugs of the shoulders. Yet these things are done daily before our eyes, and nobody seems astonished.

Most of the London presses are worked by steam; logs and marble are sawed, and chickens are hatched by steam; potatoes are boiled, money is coined, whiskey distilled, water is pumped, bullets are driven, gun-barrels bored, watch cases turned, foul clothes washed, tortoise shell combs mended, anchors hammered, ships' cables twisted, linen is bleached, sugar refined, jellies and soups are made, and houses warmed, by steam; in short, there is scarcely an object of human necessity, comfort or luxury, in the production of which some use is

not made of this universal and most accommodating of all agents.

No man can set bounds to its utility and the modes of its application. We shall not be surprised to find it, before the year is out, employed to extinguish fires, to blast rocks, or in excavating the earth for canals; some of us may live to see men enabled, by its assistance, to traverse the air, or explore the depths of the ocean; and who knows even but that its energies may in some future age, when man's knowledge and ingenuity shall have reached their highest state of perfection, be successfully directed to the discovery of the philosopher's stone, the north-west passage, and the long-sought for "perpetual motion?"

To prepare Starch from Potatoes.—Grind a quantity of potatoes into a pulp by rubbing them on a plate of tin in which a number of holes have been made, then put them into a hair sieve, and pour cold water over them as long as a milky liquid passes through. This liquid is to be received into a basin, and when a whitish powder has settled at the bottom, the liquid is to be poured off it, and the powder repeatedly washed with spring water, until it becomes perfectly white. When the last liquor has been poured off, the basin is to be placed in a warm place till the starch be perfectly dry.

Observation.—Twenty pounds of good potatoes, treated in this way, generally yield about four pounds of starch.

Mode of Thrashing in Germany.—A laborer's hire is his meat and two goschens, about two pence half-penny a day, unless he happens to be employed in thrashing, in which case he usually makes a contract for a sixteenth measure of the whole quantity of grain he thrashes out. As the entire village resounds from end to end with this operation, I shall state a few particulars respecting it which are likely to escape a more fugitive traveller, or one less curious in "re-rustica." Thrashing here is executed with a skill unknown to a less musical people. To be an expert thrasher it appears to me as requisite to have had a thrashing master, as a master for any other given art or accomplishment. They thrash with a perfect regard to time, in all the alternations of triple and common measure, making the transition from one to the other with the greatest exactness. There are some times no fewer than seven or eight flails in concert; when it is a simple quarter, and one of the performers happens to drop out, which is frequently the case, the transition is immediately, and without the least interruption, into triplets. Occasionally the effect is graced by some very delicate gradations of forte and piano, raliemando, crescendo, morcendo, accellerando—and the whole executed with as much precision as if a note book lay before each performer. When the piano is to be particularly delicate, the tips of the flails are used, which affords an opportunity of combining grace with dexterity; it is then the merest scarcely audible tap, and costs the least possible effort. Then comes the crescendo, swelling into a tremendous barn-echoing staccato—downright thrashing in fact; and what I particularly wish to enforce upon the farmer, the flail during the whole movement is never raised higher than the head, which I could not help especially taking a note of for the good of our practical agriculturists, when I recollect how much unnecessary brawn is expended on our thrashing floor to no purpose. Thus we see his genius for music never forsakes the German in any situation or occupation of life; it follows him into his commonest employments; and no doubt is their advantage, on the principle of "studio fallente laborem," in making it in all similar exertions an arithmetical operation. What is the story of Amphion building his Thebes, but an allegorical illustration of the same benefit of lightening labor by music? The German thrasher has the advantage of the Theban architect, for he turns the labor itself into a kind of music, though somewhat monotonous to be sure.—[Sir A. B. Falkner's Visit to Germany.]

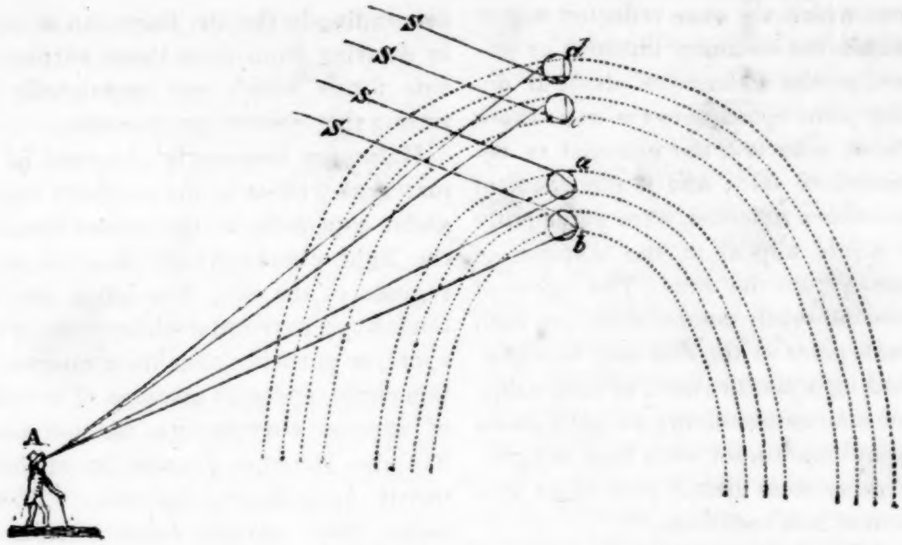
Early Frugality.—In early childhood you lay the foundation of poverty or riches, in the habits you give your children. Teach them to save every thing—not for their *own* use, for that would make them selfish—but for *some* use. Teach them to *share* every thing with their playmates; but never allow them to destroy anything. I once visited a family where the most exact economy was observed; yet nothing was mean or uncomfortable. It is the character of true economy to be as comfortable with a little, as others can be with much. In this family, when the father brought home a pack-

age, the older children would, of their own accord, put away the paper and twine neatly, instead of throwing them in the fire, or tearing them to pieces. If the little ones wanted a piece of twine to spin a top, there it was in readiness; and when they threw it upon the floor, the older children had no need to be told to put it again in its place.—[Frugal Housewife.]

SPONTANEOUS COMBUSTION.——That animal bodies are liable to internal combustion is a fact which was well known to the ancients. Many cases which have been adduced as examples of spontaneous combustion are merely cases of individuals who were highly susceptible of strong electrical excitation. In one of these cases, however, Peter Bovisteau asserts that the sparks of fire thus produced reduced to ashes the hair of a young man; and John de Viana informs us, that the wife of Doctor Frielas, physician to the Cardinal de Royas, Archbishop of Toledo, emitted by perspiration an inflammable matter of such a nature that, when the ribbon she wore over her shift was taken from her, and exposed to the cold air, it instantly took fire and shot forth like grains of gunpowder. Peter Borelli has recorded a fact of the very same kind respecting a peasant whose linen took fire, whether it was laid up in a box when wet or hanging in the open air. The same author speaks of a woman who, when at the point of death, vomited flames, and Thomas Bartholia mentions this phenomenon, as having often happened to persons who were *great drinkers of wine and brandy*. Ezekiel de Castro mentions the singular case of Alexandrinus Megeteus, a physician, from one of whose vertebrals there issued a fire which scorched the eyes of the beholders, and Kantius relates, that during the wars of Godfrey of Bologne, certain people of the territory of Nivers were burning with invisible fire, and that some of them cut off a foot or a hand where the burning began in order to arrest the calamity. —[D. Brewster's Letters on Natural Magic.]

ROWLAND'S FORCING PUMP.—According to public notice, a trial was made on Wednesday of the power of this machine to supply the engines in case of fire, and the extent to which it would propel the water through the hose. The hose was laid in Chapel street, a thousand feet in length, extending from the mill in Union st. to Forbes' buildings, corner of Church and Chapel streets. At the signal given, the pump was set in motion—in two minutes the water reached the extent of the hose, and in four minutes the engine began to play on the buildings, throwing the water upon the roof of Forbes' four stories—the pump furnishing much more than the engine could deliver, probably enough for two or three. The immense importance of this machine, in case of fire, is now so decidedly established, that we think our city authorities can no longer delay in securing its benefits. For supplying water, it is worth all the other means in the city combined; and we trust that the niggardly policy of saving two or three hundred dollars and leaving hundreds of thousands in jeopardy will no longer be pursued, by the guardians of the public weal. The advantages of the pump can be extended with equal facility in every direction, and we believe similar improvements may be made in other parts of the city, by which all may derive equal benefit and protection.—[New-Haven Herald.]

SELF-ACTING FIRE ALARM.—An invention, christened with this name, was brought to this office last week for short exhibition. The purpose of the machine is to give timely alarm when fire occurs in any part of the house in which it is placed. Only one is necessary to a house of the largest size, and if rightly put up, cannot fail to give seasonable warning of the approaching danger. It is intended to be located in the sleeping-room of the "man of the house," and if desired, will also answer the purpose of a fashionable and convenient looking-glass. Its communication with the other apartments is accomplished by means of small cords, which pass entirely round each room in the upper corners of the walls, and are supported by small pullies. Whenever a room takes fire the string burns off, and this puts the "Alarm" in operation, and unless the tenant is an uncommon sleepy fellow, his house may be saved with very little trouble. A further description at this time, is perhaps unnecessary, as the advertisements and handbills already before the public may be referred to. As far as our opinion goes, we believe the invention above mentioned to be a simple and safe agent for the security of our fellow citizens against the continual losses of life and property to which they are liable.—[Brooklyn Advertiser, L. I.]



Of the Rainbow.—The phenomena of the rainbow consists, as every person knows, of two bows, or arches, stretching across the sky, and tinged with all the colors of the prismatic spectrum. The internal or principal rainbow, which is often seen without the other, has the *violet* rays *innermost*, and the *red* rays *outermost*. The external, or secondary rainbow, which is much fainter than the other, has the violet color outermost, and the red color innermost. Sometimes supernumery bows are seen accompanying the principal bows.

As the rainbow is never seen unless when the sun shines, and when rain is falling, it has been universally ascribed to the decomposition of white light by the refraction of the drops of rain, and their reflection within the drops. The production of rainbows by the spray of waterfalls, or by drops of water scattered by a brush or syringe, is an experimental proof of their origin.

Let an observer be placed with his back to the sun, and his eye directed through a shower of rain to the part of the sky opposite to the sun. As the drops of rain are spherical particles of water, they will reflect and refract the sun's rays, according to the usual laws of refraction and reflection. Thus in the preceding figure, where *s s s s* represent the sun's rays, and A the place of a spectator, in the centre of the two bows (the planes of which are supposed to be perpendicular to his view), the drops *a* and *b* produce part of the *inner* bow by two refractions and one reflection; and the drops *c* and *d* part of the exterior bow, by two refractions and one reflection.

This holds good at whatever height the sun may chance to be in a shower of rain; if high, the rainbow must be low; if the sun be low, the rainbow is high: and if a shower happen in a vale when a spectator is on a mountain, he often sees the bow completed to a circle below him. So in the spray of the sea, or a cascade, a circular rainbow is often seen; and it is but the interposition of the earth that prevents a circular spectrum from being seen at all times, the eye being the vertex of a cone, whose base (the bow) is in part cut off by the earth.

It is only necessary, for the formation of a rainbow, that the sun should shine on a dense cloud, or a shower of rain, in a proper situation, or even on a number of minute drops of water, scattered by a brush or by a syringe, so that the light may reach the eye after having undergone a certain angular deviation, by means of various refractions and reflections, as already stated. The light which is reflected by the external surface of a sphere, is scattered almost equally in all directions, setting aside the difference arising from the greater efficacy of oblique reflection: but when it first enters the drop, and is there reflected by its posterior surface, its deviation never exceeds a certain angle, which depends on the degree of refrangibility, and is, therefore, different from light of different colors: and the density of the light being the greatest at the angle of greatest deviation, the appearance of a luminous arch is produced by the rays of each color at its appropriate distance. The rays which never enter the drops produce no other effect than to cause a brightness, or haziness, round the sun where the reflection is the most

oblique: those which are once reflected within the drop exhibit the common internal or primary rainbow, at the distance of about 41 degrees from the point opposite to the sun: those which are twice reflected, the external or secondary rainbow, of 52°; and if the effect of the light, three times reflected, were sufficiently powerful, it would appear at the distance of about 42 degrees from the sun. The colors of both rainbows encroach considerably on each other; for each point of the sun may be considered as affording a distinct arch of each color, and the whole disc as producing an arch about half a degree in breadth, for each kind of light; so that the arrangement nearly resembles that of the common mixed spectrum.

A *lunar rainbow* is much more rarely seen than a solar one; but its colors differ little, except in intensity, from those of the common rainbow.

The appearance of a rainbow may be produced at any time, when the sun shines, as follows: opposite to a window, into which the sun shines, suspend a glass globe, filled with clear water, in such a manner as to be able to raise it or lower it at pleasure, in order that the sun's rays may strike upon it. Raise the globe gradually, and when it gets to the altitude of forty degrees, a person standing in a proper situation will perceive a purple color in the glass, and upon raising it higher the other prismatic colors, blue, green, yellow, orange, and red, will successively appear. After this the colors will disappear, till the globe be raised to about fifty degrees, when they will again be seen, but in an inverted order; the red appearing first, and the blue, or violet, last. Upon raising the globe to about 54°, the colors will totally vanish.

In the highest northern latitudes, where the air is commonly loaded with frozen particles, the sun and moon usually appear surrounded by *halos*, or colored circles, at the distances of about 22 and 46 degrees from their centres. Several new forms of *halos* and *paraselenæ*, or mock-moons, have been described by Captain Ross and Captain Parry. And Captain Scoresby, in his account of the Arctic Regions, has delineated an immense number of particles of snow, which assume the most beautiful and varied crystallizations, all depending more or less on six-sided combinations of minute particles of ice.

When particles of such forms are floating or descending in the air, there can be no difficulty in deriving from them those various and intricate forms which are occasionally met with among this class of phenomena.

Halos are frequently observed in other climates, as well as in the northern regions of the globe, especially in the colder months, and in the light clouds which float in the highest regions of the air. The halos are usually attended by a horizontal white circle, with brighter spots, or parhelia, near their intersections with this circle, and with portions of inverted arches of various curvatures; the horizontal circle has also sometimes *anthelia*, or bright spots nearly opposite to the sun. These phenomena have usually been attributed to the effect of spherical particles of hail, each having a central opaque portion of a certain magnitude, mixed with oblong particles, of a determinate form, and floating with a certain constant obliquity to the horizon. But all these arbitrary suppositions, which were imagined by Huygens, are in themselves extremely complicated and improbable. A much simpler, and more natural, as well as more accurate explanation, which was suggested at an earlier period by Mariotte, had long been wholly forgotten, till the same idea occurred to Dr. Young. The explanation given by the last mentioned philosophers is, that water has a tendency to congeal or crystallize in the form of a prism, and that the rays of light passing through these prisms, (which are disposed in various positions,) by their own weight, are so refracted as to produce the different appearances which halos and parhelia have been observed to assume.

The colors which these phenomena exhibit are nearly the same as the rainbow, but less distinct; the red being nearest to the luminary, and the whole halo being very ill-defined on the exterior side. Sometimes the figures of halos and parhelia are so complicated, as to defy all attempts to account for the formation of their different parts; but if the various forms and appearances which the flakes of snow assume be considered, there will be no reason to think them inadequate to the production of *all* these appearances.

TO TAKE OUT GREASE SPOTS from a carpet, or any other woollen cloth, dissolve a piece of pearl-ash of the size of a pea in a half a tea-cup of warm water; or a piece twice the size in a

full tea-cup. Pour some of the solution on the grease spot, and continue to rub it hard with a clean brush or woollen cloth until it is nearly dry, and your carpet or garment will be as clean as ever. I have tried it repeatedly and found it effectual.

Manufactories, Botanic Garden, of Liverpool, and Railway connecting Liverpool with Manchester. By B. P. [From the New-York Farmer.]

Liverpool, though situated in the most extensive manufacturing *county* in the kingdom, is not in itself, properly speaking, a manufacturing town, still many branches of manufactured articles are on an extensive scale, viz. Potteries, breweries, foundries, &c. The making of files, watches, watch movements and tools used by watch makers, is carried on to a greater extent probably in Liverpool and its environs than in any part of the kingdom. There are also extensive manufactories of chain cables, anchors, steam engines, &c. There is also an establishment for glass staining in landscape, figures, or ornaments; the art is brought to a high degree of perfection, and has a most beautiful effect in church windows.

The *Botanic Garden* is pleasantly situated in the environs, and is enclosed by a stone wall with two ornamental lodges at the entrance, and a very large conservatory. It appears to be under the eye of those who have not only the taste but the means of gratifying it, as every thing appears to be of the most permanent construction. The taste for botanical studies, and the establishment of such a fine garden as that at Liverpool, is worthy of imitation by every large city. To describe the contents would be tedious; suffice it to say, the garden appeared to contain every species of useful and ornamental fruit or flowers. Strangers are admitted by taking a note from any of the directors to the superintendant.

Liverpool abounds in fine public buildings, charitable and literary institutions, several fine monuments, &c. but I pass over them to give you a short description of the railway which connects it with Manchester, and which is probably one of the most stupendous undertakings of the age. The work was commenced in June, 1826. The entrance commences in Wapping, near the Docks, and passes under the town in a gentle curve to the right or south-east, till it reaches the bottom of the inclined plane, which is a perfectly straight line 1,980 yards in length, with a uniform rise of $\frac{3}{4}$ of an inch to a yard. The tunnel under the town is 22 feet wide and 16 feet high, the sides being perpendicular for 5 feet in height, surrounded by a semi-circular arch of 11 feet radius—the total length is 2,250 yards. It is whitewashed throughout, and illuminated with gas. At the upper or eastern end of the tunnel, the traveller emerges into a spacious and noble area 40 feet below the surface of the ground, cut out of the solid rock, and surmounted on every side by walls and battlements. A massive Moorish archway stretches across the road, close by the engine houses, which are employed in the generation of steam power to draw goods from the mouth of the tunnel in Wapping, and the carriages with passengers through the tunnel on their return from Manchester. Crossing the street the road descends for five miles and a half at the rate of 4 feet in the mile. At a little distance it is carried through a deep marl cutting, under several stone arches, beyond which is the great rock excavation through Olive Mount; the depth is 70 feet.

A night journey through this artificial ravine must be highly interesting and sublime; a few minutes suffice to carry the traveller to the magnificent embankment between Broad, Green, and Roby, which in fine weather presents a portion of the most interesting and varied landscape which meets the eye during the journey to Manchester. On the right a superb line of trees partially bound the view for some distance, when Childwald Vale bursts upon the sight, with its gently rising green slope; on the side of which the church peeps through the trees, and forms an object of uncommon interest; its dark red color firmly contrasting with the masses of fine green foliage by which it is surrounded.

> "—— The land was beautiful:
> Fair rose the spires, and gay the buildings were,
> And rich the plains."

The Abbey of Childwald and its grounds display themselves still farther in the rear; Roby Hall and domains, with the richly wooded townships of Little Woolton and Halewood, the lofty back ground of Runcorn in the distance; on the left, Summer Hill and its beautiful grounds, a richly cultivated country, broken up into picturesque variety by the nature of the ground and the varied bodies of foliage and forest scenery which mark the sight of Knows-

ley Hall, a glimpse of which may be caught *en passant*. The venerable tower of Huyton Church rising above the trees seems to dispute the way in front, whilst the spire of Prescot Church forms a conspicuous object a little more to the left. On the summit of the hill, eight miles from Liverpool, begins the inclined plane at Whiston, which rises at the rate of $\frac{3}{8}$ of an inch in a yard, and is a mile and a half long. About half a mile from the top of this plane the turnpike road from Liverpool to Manchester crosses the line of the railway, by a substantial stone bridge of very curious mechanical construction. We then soon come to what is called Parr Moss, the depth of which is about 20 feet; and here the material forming the railway, as it was deposited, sank to the bottom, and now forms an embankment in reality 25 feet high, though only 4 or 3 feet appear above the surface of the Moss.

The borders of this waste are in a state of increasing cultivation, and carrying the railway across this Moss will hasten the enclosure of the whole area. Leaving Parr Moss the great valley of the Sankey speedily breaks upon the sight, with its canal at the bottom. Over this valley the railway is carried along a magnificent viaduct of nine arches, each 50 feet span, the height from the top of the parapets to the water in the canal being 70 feet, and the width of the railway between the parapets 25 feet; from this spot a splendid prospect of the country is obtained, with the meanderings of the canal through a richly wooded country, where the vessels which navigate the Mersey may frequently be seen moving along the canal, impelled by the wind apparently through fields, with all their canvass set, amidst trees and rising grounds, forming a view at once unique and picturesque—whilst the most distant part of the landscape, Newton race-course, and a luxuriant back ground, on the left, with Barton wood, Winwick spire, and all the varieties of a rich agricultural country, embracing the lonely vale through which the canal runs towards the Mersey, on the right, presents a scene on which the eye delights to rest. A distant view of Warrington with the upper reach of the Mersey and Helsby Hills in the distance, form prominent objects. On the other side of Newton is the great Kenyon excavation, near the end of this cutting the Kenyon and Leigh junction railway joins the Liverpool and Manchester line, pointing to the two towns respectively; this railway, at the same time, by means of the Bolton and Leigh line, perfects the communication between Bolton, Manchester and Liverpool. Beyond Bury-lane and the small river Gless or Glazebrook, lie the borders of the far-famed Chat Moss.

This barren waste comprises an area of about 12 miles square, varying in depth from 10 to 35 feet, the whole Moss being of so spongy a nature that cattle cannot walk over it, but it is now under a process of draining and cultivation: over this morass the road is carried. There is little of interest in the scenery except on the left, Worsley Hall and grounds, Tidsley Church, with the back ground of Billinge Hills. Having accomplished the passage of the moss and traversed the Barton embankment of about one mile, the railway crosses the Worsley Canal, and here the traveller first sees indications of a manufacturing district. Cotton factories begin to appear, and as the road approaches Manchester the scene acquires additional interest from the presence of several country seats. The immediate approach to Manchester is through Salford, over the river Irwell; a very handsome stone bridge and a series of splendid arches finally conduct the railway to the Company's station. The bridges alone, exclusive of the culverts and foot stages, are sixty-three in number, which have cost the Company £99,065 11*s.* 9*d.* As an instance of what may be accomplished by the railway, the following is annexed, which took place in February 1831.

The Locomotive Engine, called the Sampson, started from the tunnel mouth with thirty loaded waggons, occupying a line of 120 yards long. The weight of the whole was as follows:

Gross weight, 151 tons.

	Tons.	Cwt.	Qr.
Net weight of Oats and Sacks	82	10	0
Do. of Merchandize	24	15	0
Do. of 15 persons	1	00	0
	108	05	0

She performed the journey to Manchester, a distance of twenty-nine miles and three quarters, in two hours and thirty-four minutes, including a stop of thirteen minutes for taking in water—her greatest speed was twenty miles per hour, and the average about twelve miles per hour. Although the railway cost £820,000, equal to $3,630,800, still the profits are such

that the shares bear a very high premium. The arrival of an American in a place like Manchester is generally attended with unpleasant sensations; the coach generally leaves passengers at the "Bridgewater Arms," an old inn, and more worthy of a preference from its antiquity than its excellence. A little observation will soon learn a traveller that passengers arriving in the coaches do not receive the attention that those who come in a post chaise or private carriage do. Appearances often command respect and attention even in our republican country, and in all countries often take the place of worth.

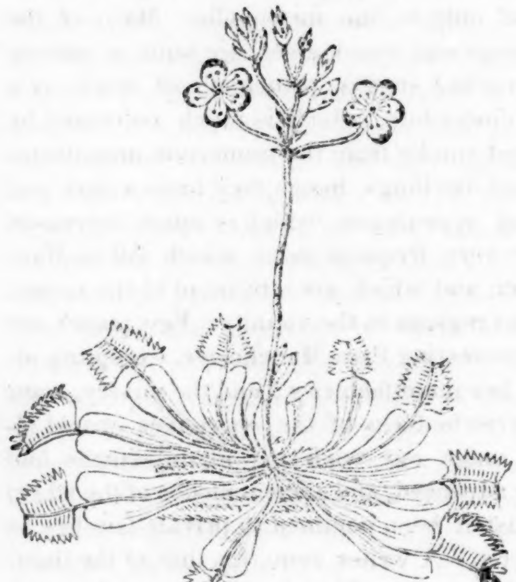
Manchester is larger than Liverpool, and is second only to the metropolis. Many of the dwellings and warehouses are built on narrow and crooked streets, principally of brick, of a very dusky hue, which is much increased by the coal smoke from the numerous manufactories and dwellings, hence they have a dark and gloomy appearance, which is much increased by the very frequent rains which fall in Manchester, and which are attributed to the mountainous regions in the vicinity. Few places are less interesting than Manchester, excepting always her manufactories; and the misery, want and wretchedness of the operatives would almost make one wish that manufactures had never advanced, and ancient modes of the wheel and distaff been confined to private families as formerly. A writer remarks, that of the thousands that throng Manchester, crowded together in narrow streets, where the everlasting din of machinery is heard, you scarcely see a person whose appearance bespeaks comfort. However, we saw some interesting objects, which I will describe in my next.

On the Composition of Organized Structures, Similarity of Charcoal to the Diamond, &c. Selected for the Mechanics' Magazine, from Donovan's Chemistry.

Notwithstanding the perplexing diversity of form which vegetable substances assume, experiments have proved that they are all composed of the same ultimate materials, and these very few in number. We may select any vegetable structure as the representative of all the rest: and, by examining others in the same manner, it will be found that they present the same results. The method by which the component elements are separated is simple; the vegetable is merely exposed to the action of fire: not an open fire, for in this way all its parts would be dissipated or burned away; but in a vessel calculated to retain its principles in such a manner as to permit their being brought under examination. Green wood will be a good instance. Take a common gun barrel, the touch-hole of which is stopped; push a small cylinder of green wood down to the breech, and place that end horizontally in a good coal fire. As the wood is heated, the water, which is the chief ingredient of its juices, distils over, and drops from the open end of tube. In proportion as the water distils, from being insipid, it becomes sour. Shortly after, a gas issues out of the tube, and may be collected by tying a moist bladder, the common air being well pressed out of it, round the mouth of the tube. If, when the gas ceases to issue, the contents of the tube be examined, the piece of wood will be found altered into a black, dry, light, sonorous mass, retaining, however, its texture, though much reduced in size. It is, in short, converted into charcoal, or, in chemical language, carbon; and, if its weight be added to that of the gas, the mere water, and the sour water, the result will be the original weight of the wood without loss; hence these are all the ingredients which composed the wood. As a general summing up, we may recapitulate, that from wood we obtain hydrogen, carburetted hydrogen, bicarburetted hydrogen, carbonic oxide, carbonic acid, ascetic acid, holding tar, ammonia, and charcoal. By multiplying experiments on other vegetable structures, we learn, that all of them, however complicated when made to undergo the ordeal of heat in confined vessels, resolve themselves, like wood, into the four elements, oxygen, hydrogen, carbon, and azote; the latter being in such small quantity as to be barely discoverable. These, again, by combining amongst themselves, produce the compounds above described, but the four ingredients mentioned are what are called the ultimate elements of all vegetable matter, notwithstanding its apparent diversity. A striking proof of the extraordinary differences of appearance which the same body may assume, and also of the intrinsic worthlessness of some of those objects on which society sets the highest value, occurs in the instance of the substance under consideration. Every one knows the enormous price at which diamonds of good quality and

size are estimated. The celebrated regent diamond, which was set in the handle of the late Emperor Napoleon's sword of state, is now valued at £260,000, although only $1\frac{1}{8}$ ounce, and was originally purchased for £20,400 by Thomas Pitt, grandfather of the great Earl of Chatham, while Governor of Madras. Yet this precious ornament is neither more nor less than a piece of charcoal; and, surprising as it may appear to those hitherto unacquainted with the fact, it is well proved by numerous experiments, that between the diamond and charcoal there is almost no difference of composition; the diamond burns in oxygen with brilliant flame, and, like charcoal, forms carbonic acid; like charcoal, it forms steel by combination with iron; and the difference between the two bodies seems to be chiefly in their state of aggregation, the diamond being harder and crystallized; it is also a little purer in composition. The pure portion of charcoal is distinguished among chemists by the name of carbon.

Having acquired some acquaintance with the vast variety of form under which the objects constituting the vegetable world appear, and the simplicity of their composition, the next subject of contemplation is the animated part of the creation,—the most interesting and stupendous of all. How much more admirable and surprising must the structure of a living animal appear, when it is known that it is composed of but a few elements, such as have been formerly described: little more than the meanest vegetable, and fewer than many minerals. The materials of which animals are composed being nearly the same, as those which compose plants, the difference is in their relative quantity, and in the mode of combination. The combustible substance, phosphorus, has been detected, in small quantity, in some vegetables, as in the onion; but it exists in large quantities in the bones of animals: not in the state of phosphorus, as commonly seen, but disguised by combination with oxygen in the state of an acid, and this acid combined with lime. The bones of animals, then, consist chiefly of lime and phosphoric acid; at least these ingredients compose their earthly basis, as it is called; but it is impregnated with animal matter that adds greatly to their strength, toughness, and solidity. The other element which exists largely in animal matter is azote: it is also a constituent part of several kinds of vegetable matter; and it is singular, that the same azote, which adds so much to the nutritiousness and flavor of animal food, renders vegetable matter disgusting to the taste, and poisonous. The chief substances, then, which enter largely into animal matter, are oxygen, hydrogen, azote, carbon, phosphorus, and lime. We find some other kinds of matter, as certain acids and metals, but in quantity so small as not to affect the truth of the above statement, that the foregoing six ingredients constitute the great bulk of the animal fabric.



Dionæa Muscipula, Venus' Fly Trap. By Q. Z. [From the New-York Farmer.]

This singular plant is considered one of the most remarkable and curious productions of the vegetable world. It belongs to the class Decandria, order Monogynia of Linnæus. The leaves are radial, lying upon the ground, and consisting of two parts. The lower, which is strictly speaking the leaf, is long, cordate, or heart shape, and is terminated by a single conservative appendage, which forms the upper half. This part consists of two lobes, the margins of which are terminated by cilicate divisions, like the teeth of a rat-trap, to which this singular anomaly is thought to bear a close resemblance, both in its appearance and its manner of operation. These lobes, particularly in dry weather, possess in a remarkable degree the vegetable irritability which has long

been a source of wonder among naturalists, and which is very distinct in the well known sensitive plant and some others. If a fly or any other insect happens to alight upon one of these lobes his fate is almost certain. It closes immediately—the teeth lock themselves together and the poor insect is a prisoner. The greater the struggling the firmer the clasp, and it is either crushed or starved to death; when, the irritation having ceased, the lobe expands itself as before. Irritation with any substance, as a straw, stick, &c. produces the same effect.

It is a native of the swamps and marshes of Georgia and the Carolinas, and bears a profusion of beautiful white flowers in July and August, on stems five or six inches in height.

Newburgh, January, 1833.

Memoir of Mr. Holt.—The following is the brief memoir we had intended to have accompanied the description of his (Holt's) new Hotel, in our January number:

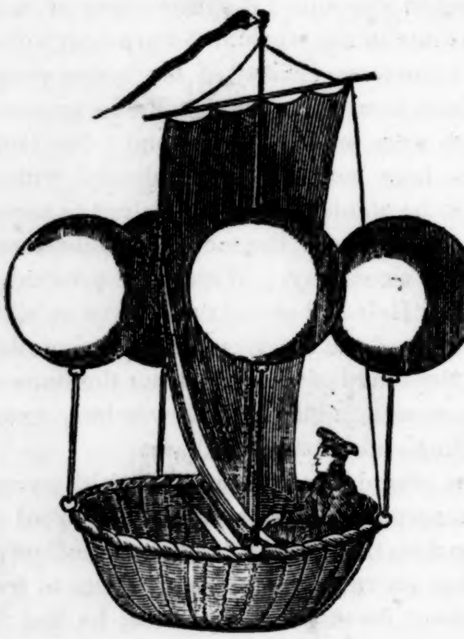
Mr. Holt came to this city from Salem, Mass., about the year 1808, and for some time obtained employment in the business to which he had been brought up, that of a cabinet-maker; he also opened a small store as a victualling-house, in the neighborhood of the Fly-Market, which was managed by Mrs. Holt, and received all that attention which is always bestowed by a clever and affectionate woman to the interests of her husband. He had a numerous young family, and was for a long period in such ill health, that he was eventually induced to leave the bench, and devote all his energies to improving his tavern, in which he succeeded to a very considerable extent.

In this establishment he continued until the year 1814, when Mr. Holt, becoming attached to the commissariat department, (during the time of the location of troops upon the Harlæm lines of the city defences,) opened a boarding-house for the accommodation of the officers, contiguous to their posts. Here he continued until the close of the war dispersed his friends. His old stand at Fly-Market being vacant, he again took possession of it, and continued to give such general satisfaction to those who resorted to his house, that in a short time he was under the necessity of enlarging his premises for their accommodation. Business still increasing, and promising a still further increase, he was induced to take larger premises in Front street, situated between Burling slip and Fulton street. Before these were fit to receive his friends and the public, he found it indispensable to make considerable alterations—much more, indeed, than his own funds could accomplish—but in this respect he found no difficulty, for his persevering industry, integrity, and general habits of business and living, had not escaped the observation of many of his neighbors, and he readily obtained sufficient credit to enable him to open his new establishment. A very short time elapsed, after its completion, before Mr. Holt had to encounter the misfortune of being left destitute in the world. A carpenter's shop in the immediate vicinity of his house caught fire, which soon communicated to his premises, and both were burnt to the ground. Mr. Holt's all was here consumed—absolutely without clothing, he and his family contrived to escape unhurt, but without the means of subsistence even for a single day. With great presence of mind Mrs. Holt had seized the drawer in which was contained the receipts of the previous day; but in the hurry of escaping from the flames, a false step was made, and all was lost, except the trifling sum of three shillings.

To be placed in such a situation with a young and numerous family, is enough to appal the stoutest heart, but in Mr. Holt it seemed only to rouse his energies, and stimulate him to fresh exertions. As might be expected, he had the sympathetic expressions of numerous friends, and a subscription was proposed to be raised in his behalf, but, with a spirit of independence, which cannot be too much admired, he firmly refused to avail himself of assistance by such means.

Although Mr. Holt was involved in debt, and it was well known that he was pennyless, he had no difficulty in obtaining another house in Fulton street; and that consistent character, which he had hitherto maintained, soon enabled him once more to open an establishment equal to the one he had previously occupied: here his old friends flocked around him, and a great accession was made to them, from the peculiar circumstances of his situation being made generally known. From this period Mr. Holt's prosperity has steadily increased. In a very short time he was obliged to enlarge those premises, and eventually to take another house nearly opposite, (part of the latter is shown in

the engraving, on the right hand side of the plate, and where the words "Water street" are inserted.) He continued in active business in those establishments, until January in the present year, when the magnificent building which we have attempted to describe was opened to the public, by whom we have the satisfaction to state he has hitherto been liberally supported. There he now remains an example worthy the imitation of all, and we beg he will accept of our best wishes for his continued prosperity and happiness.



[We copy the following interesting account of Balloons from "Mr. Partington's British Cyclopædia," a work of unparalleled cheapness and of great merit.]

The idea of inventing a machine which should enable us to rise into the air appears to have occupied the human mind even in ancient times, but was never realized till the last century. The first suggestion for a sailing vessel, with any pretensions to the character of science, is due to Francis Lana, a distinguished Jesuit. This occurred in 1670; and the arrangement of the apparatus will be best understood by referring to the preceding figure.

Lana, it will be seen, proposed to support his car by the aid of four balls. These were to be exhausted of air; and the inventor argued that their diminished weight would cause the balls to support themselves and the aeronaut. We notice this apparatus, as similar schemes have been put forth even within our own times; but it must be obvious to any intelligent mind, that the external pressure of the atmosphere would destroy the vessels, even if they could be rendered light enough. Henry Cavendish having discovered, about 1766, the great levity of inflammable air or hydrogen gas, Dr. Black, of Edinburgh, was led to the idea that a thin bladder, filled with this gas, must ascend into the air. Cavallo made the requisite experiments in 1782, and found that a bladder was too heavy, and paper not air tight. Soap bubbles, on the contrary, which he filled with inflammable air, rose to the ceiling of the room, where they burst. In the same year, the brothers Stephen and Joseph Montgolfier constructed a machine which ascended by its own power. In November, 1782, the elder Montgolfier succeeded, at Avignon, in causing a large bag of fine silk, in the shape of a parallelopiped, and containing 40 cubic feet, to mount rapidly upwards to the ceiling of a chamber, and afterwards, in a garden, to the height of 36 feet, by heating it in the inside with burning paper. The two brothers soon afterwards repeated the experiment at Annonay, where the parallelopiped ascended in the open air 70 feet. A larger machine, containing 650 cubic feet, rose with equal success. They now resolved to make the experiment on a large scale, and prepared a machine of linen, lined with paper, which was 117 feet in circumference, weighed 430 pounds, and carried more than 400 pounds of ballast. This they sent up, June 5, 1783, at Annonay. It rose in ten minutes to a height of 6,000 feet, and fell 7,668 feet from the place of ascension. The method used to cause it to ascend was, to kindle a straw fire under the aperture of the machine, in which they threw, from time to time, chopped wood. But, though the desired effect was produced, they had no clear nor correct idea of the cause. They did not attribute the ascension of the vessel to the rarefaction of the air enclosed in it by the operation of the heat, but to a peculiar gas, which they supposed to be developed by the burning of the straw and wood. The error of this opinion was not discovered till a later period. These experiments roused the attention of all the philosophers of Paris. It occurred to some of them, that the same effect might be produced by inflammable air. M. Charles, Professor of Natural Philosophy, filled a ball of lutestring, 12 feet in diameter, and coated with a varnish of gum-elastic, with such gas. It

weighed 25 pounds, rose 3,123 feet in two minutes, disappeared in the clouds, and descended to the earth, after three-quarters of an hour, at the village of Gonesse, about 15 miles from Paris. Thus we see two original kinds of balloons: those filled with heated air, and those filled with inflammable air.

The process of filling balloons on the small scale for this species of aerial navigation, will readily be understood by a reference to the accompanying sketch, in which a simple conden-

ser is employed. The common mode is to generate hydrogen gas in a bottle, by pouring dilute sulphuric acid on granulated zinc, but the hot and moist vapor from the acid speedily destroys the balloon. To prevent this, the experimentor has only to employ a second bottle containing water, and carry a bent-pipe from the first bottle through a cork in the second; it dips beneath the surface, and is condensed, and the pure hydrogen ascends by the second pipe to the balloon.

To continue: Montgolfier had gone to Paris, and found an assistant in Pilatre de Rozier, the superintendent of the Royal Museum. They completed together, in October, 1783, a new machine, 74 feet in height, and 48 in breadth, in which Rozier ventured for the first time to ascend, though only 50 feet. The balloon was from caution fastened by cords, and soon drawn down. Eventually the machine, being suffered to move freely, took an oblique course, and at length sunk down gradually about 100 feet from its starting place. By this the world was convinced that a balloon might, with proper management, carry a man through the air; and the first aerial expedition was determined on.

November 21, 1783, Pilatre de Rozier and the Marquis d'Arlandes ascended from the castle la Muette, in the presence of an innumerable multitude, with a machine containing 6,000 cubic feet. The balloon, after having attained a considerable height, came down, in 25 minutes, about 9,000 yards from la Muette. But the daring aeronauts had been exposed to considerable danger. The balloon was agitated very violently several times; the fire had burnt holes in it; the place on which they stood was injured, and some cords broken. They perceived that it was necessary to descend without delay; but when they were on the surface of the earth, new difficulties presented themselves. The weak coal fire no longer supported the linen balloon, the whole of which fell into the flame. Rozier, who had not yet succeeded in descending, just escaped being burnt. M. Charles, who had joined with M. Robert, soon after informed the public that they would ascend in a balloon filled with inflammable air. To defray the necessary expenses of 10,000 livres, he opened a subscription. The balloon was spherical, 26 feet in diameter, and consisted of silk coated with a varnish of gum-elastic. The car for the aeronauts was attached to several cords, which were fastened to a net, drawn over the upper part of the balloon. A valve was constructed above, which could be opened from the car, by means of cords, and shut by a spring. This served to afford an outlet to the inflammable air, if they wished to descend, or found it necessary to diminish it. The filling lasted several days; and, December 1st, the voyage was commenced from the Tuilleries. The balloon quickly rose to a height of 1800 feet, and disappeared from the eyes of the spectators. The aeronauts diligently observed the barometer, which never stood at less than 26°, threw out gradually the ballast they had taken in to keep the balloon steady, and descended safely at Nesle. But as soon as Robert stepped out, and it was thus lightened of 130 pounds, it rose again with great rapidity about 9,000 feet. It expanded itself with such force, that it must have been torn to pieces, had not Charles, with much presence of mind, opened the valve to accommodate the quantity of gas to the rarity of the surrounding atmosphere. After the lapse of half an hour the balloon sunk down on a plain, about three miles from the place of its second ascent.

Another ascent, which nearly proved disastrous to the aeronauts, may now be noticed.

On the 15th of July, 1784, the Duke of Chartres, the two brothers Roberts, and another person, ascended with an inflammable air balloon from the park of St. Cloud, at 52 minutes past 7 o'clock in the afternoon. This balloon was of an oblong form, measuring 55½ feet in length, and 34 in diameter. It ascended with its greatest extension nearly horizontal; and after remaining in the atmosphere about 45 minutes, it descended at a little distance from whence it had ascended, and at about 30 feet distance from the *Lac de la Garenne*, in the park of *Meudon*. But the incidents that happened in this aerial excursion deserve to be particularly described, as nothing like it had happened before to any of the aerial travellers. This machine contained an interior smaller balloon, filled with common air; by which means, according to a mode hereafter to be mentioned, the machine was to be made to ascend or descend without any loss of inflammable air or ballast. The boat was furnished with a helm and oars, intended to guide it, &c.

On the level of the sea the barometer stood at 30.25 inches, and at the place of departure it stood at 30.12. Three minutes after its ascending, the balloon was lost in the clouds, and the aerial voyagers lost sight of the earth, being involved in a dense vapor. Here an unusual agitation of the air, somewhat like a whirlwind, in a moment turned the machine three times from the right to the left. The violent shocks which they suffered prevented their using any of the means prepared for the direction of the balloon, and they even tore away the silk stuff of which the helm was made. Never, said they, had a more dreadful scene presented itself to any eye, than that in which they were involved. An unbounded ocean of shapeless clouds rolled one upon another beneath, and seemed to forbid their return to the earth, which was still invisible. The agitation of the balloon became greater every moment. They cut the cords which held the interior balloon, which consequently fell on the bottom of the external one, just upon the aperture of the tube, which went down into the boat, and stopped it up. At this time the thermometer showed a little above 44°. A gust of wind from below drove the balloon upwards, to the extremity of the vapor, when the appearance of the sun showed them the existenee of nature; but now, both the heat of the sun and the diminished density of the atmosphere occasioned such a dilation of the inflammable air, that the bursting of the balloon was apprehended; to avoid which they introduced a stick through the tube that proceeded from the balloon, and endeavored to remove from its aperture the inner balloon, which closed it; but the dilation of the inflammable air pushed the inner balloon so violently against the aperture of the tube, that every endeavor proved ineffectual. During this time they still continued to ascend, until the mercury in the barometer stood not higher than 24.36 inches, which shows their height above the surface of the earth to be about 5,100 feet. In these dreadful circumstances, they thought it necessary to make a hole in the balloon, in order to give an exit to the inflammable air; and the Duke of Chartres, by means of one of the banners, made two incisions, which caused a rent of between seven and eight feet. They then descended very rapidly, seeing at first no object on earth or in the heavens; but a moment after they discovered the fields, and were descending straight towards a lake, into which they must have fallen had they not thrown overboard about sixty pounds weight of ballast, which occasioned their coming down at about thirty feet beyond the edge of the lake. Notwithstanding this rapid descent, occasioned by the great quantity of gas which escaped out of the two rents in the balloon, none of the four adventurers was hurt, but spoke in the highest terms of excitement of the pleasures of their expedition.

These successful aerial voyages were soon followed by others. Blanchard had already ascended several times, when he determined to cross the channel between England and France, which is about 23 miles wide, in a balloon filled with inflammable air. He succeeded in this bold attempt, January 7, 1785, accompanied by an American gentleman, Dr. Jeffries. About one o'clock they left the English coast, and at half-past two, were on the French. Pilatre de Rozier, mentioned before as the first aeronaut, attempted, June 14, 1785, in company with Mr. Romain, to pass from the French to the English side; but the attempt was unsuccessful, and the adventurers lost their lives. M. de Rozier had on this occasion united the two kinds of balloons; under one, filled with inflammable air, which did not alone possess sufficient elevating power, was a second, filled by means of a coal fire under it. Rozier had chosen this

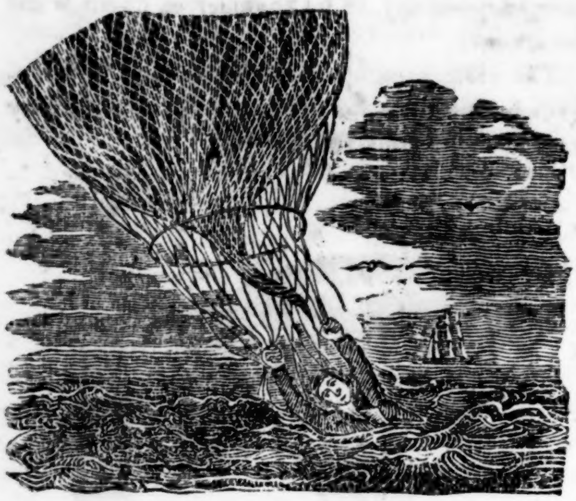
combination, hoping to unite the advantages of both kinds. By means of the lower balloon, he intended to rise and sink at pleasure, which is not possible with inflammable air; for a balloon filled with this, when once sunk to the earth, cannot rise again with the same weight, without being filled anew; while, on the contrary, by increasing or diminishing the fire under a balloon filled with heated air, it can be made to rise and fall alternately. But this experiment caused the death of the projectors. Probably the coals, which were only in a glowing state near the surface of the ground, were suddenly kindled to a light flame as the balloon rose, and set it on fire. The whole machine was soon in flames, and the two aeronauts were precipitated from the air. The condition of their mangled bodies confirms the conjecture that they were killed by the explosion of the gas. This unhappy accident did not deter others; on the contrary, the experiments were by degrees repeated in other countries.

However important this invention may be, it has as yet led to no considerable results. Its use has hitherto been confined to observations in the upper regions of the atmosphere. But should we ever learn to guide the balloon at will, it might, perhaps, be employed for purposes of which we now have hardly an idea; possibly the plan of Professor Robison might be accomplished by the construction of a gigantic balloon, which would enable us to perform an aerial circumnavigation of the earth. During the French Revolution, an aerostatic institution was founded at Meudon, not far from Paris, for the education of a corps of aeronauts, with the view of introducing balloons into armies as a means of reconnoitering the enemy. But this use of balloons was soon laid aside, for, like every other, it must be attended with great uncertainty, as long as the machine has to obey the wind. Among the French, Blanchard and Garnerin have undertaken the greatest number of aerial voyages; among the Germans, Professor Jungius, in Berlin, in 1805 and 1806, made the first. Since that time, Professor Reichard and his wife have become known by their aerial excursions. Even in Constantinople such a voyage was performed, at the wish and expense of the Sultan, by two Englishmen, Barly and Devigne. Blanchard has rendered an essential service to aeronauts by the invention of the parachute, which they can use, in case of necessity, to let themselves down without danger.

The arrangement of the parachute, with reference to its use for aeronautic purposes, may now be more fully illustrated.

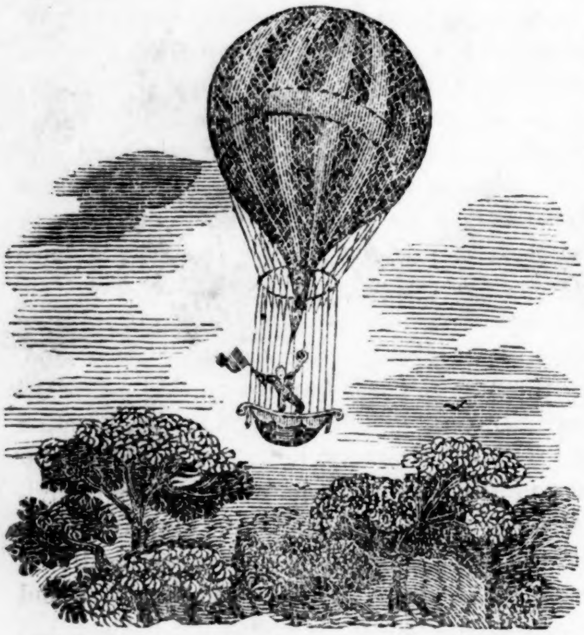
In the right hand figure, M. Garnerin's apparatus is seen as it ascended from St. George's parade. A cylindrical box, about three feet in height, and two in diameter, was attached by a straight pole to a truck or disc at the top, and from this was suspended a large sheet of linen, somewhat similar to an umbrella. The form it assumed on the descent of the aeronaut is shown in the next figure. When first cut from the balloon, it descended with amazing velocity, and those who witnessed its progress considered the destruction of the aeronaut as certain; but after a few seconds the canvas opened, and the resistance was so great, that the apparatus diminished in its speed, till on its arrival near the earth it was not greater than would have resulted from leaping a height of two feet.

Amongst the unfortunate aeronauts we may place Major Money, who ascended from Norwich, under the full impression that the aerial current would take the balloon in the direction of Ipswich. Scarcely, however, had he attained an altitude of one mile, when a violent hurricane, operating in a new direction, drove the balloon towards Yarmouth. Several small row boats immediately put out from that port, and endeavored to keep pace with the balloon, but without success; and Major Money first touched the sea about nine miles from land, and more than three from any means of assistance.



Our artist has delineated the situation of Major Money at the period we have now been describing, or rather about ten minutes after he had parted with a portion of his clothes and instruments; and it was only by the assistance of a fast sailing cutter, which happened to lay in the track of the balloon, that he was saved, when almost exhausted.

Having thus given a brief account of the early history of the aerostatic art, and of the successive improvements which the balloon has undergone both in its external form and appearance, and the nature of the material used for inflation, we may now speak of the very beautiful machines which are employed for aerial excursions by the aeronauts of the present day.



The preceding illustration exhibits a very picturesque view of the ascent of that veteran, Mr. Green, from the Park, on the occasion of the coronation of his late majesty, George IV. The balloon itself, the form of which is similar to, but infinitely more beautiful than, a pear, is composed of strips of variegated silk, the harmony of which has a particularly pleasing effect on the eye. Over this is thrown an envelope of net-work, which passing down serves as a support to which the car is attached.

The utility of aeronautic studies and experiments has been very much questioned, even by philosophical minds. M. Cavallo, well known in the philosophical world, suggested long ago that small balloons, especially those made of paper, and raised by means of spirits of wine, may serve to explore the direction of the winds in the upper regions of the atmosphere, particularly when there is a calm below; and we see the French aeronauts adopted this idea, that they might serve also for signals in various circumstances, in which no other means can be used; and letters or other small things may be easily sent by them: for instance, from ships that cannot safely land on account of storms, from besieged places, islands, or the like. The larger aerostatic machine, he adds, may answer all the above-mentioned purposes in a better manner; and they may, besides, be used as a help to a person who wants to ascend a mountain or a precipice, or to cross a river; and, perhaps, one of the machines tied to a boat by a long rope, may be, in some cases, a better sort of sail than any that is used at present. Their conveying people from place to place with great swiftness, and without trouble, may be of essential use, even if the art of guiding them in a direction different from that of the wind should never be discovered. By means of these machines the shape of certain seas and lands may be better ascertained; men may ascend to the top of mountains they had never visited before; they may be carried over marshy and dangerous grounds; they may by that means come out of a besieged place, or an island; they may, in hot climates, ascend to a cold region of the atmosphere, either to refresh themselves, or to observe the ice which is never seen below; and, in short, they may be thus taken to several places, to which human art hitherto knew of no conveyance.

New Method of Computing the Moon's Distance from the Earth.—The data on which the computation is made are the Moon's

sideral period, and the force of gravity on the earth's surface. The force of gravity on the earth's surface, as ascertained by the pendulum, is sufficient to make a heavy body descend in vacuo about $16\frac{1}{12}$ feet the first second of its fall. From this fact can be easily ascertained what the sideral period of a body would be, revolving round the earth in vacuo, one semidiameter of the earth from its centre.

When this sideral period is ascertained, then take the moon's sideral period, and say, by the Rule of Three: The squares of these two periods are to each other, as the cubes of the distances from the earth's centre.

We have made the computation, and find the moon's distance to be about sixty semidiameters of the earth from its centre; which corresponds with the general computation founded on the moon's horizontal paralax.

On a Means of effecting an Useful Continued Motion. By J. Gorrie. To the Editor of the American Mechanics' Magazine.

It is in the nature of things that he who under any circumstances attempts an object that has been deemed of impossible attainment, will subject himself to the charge of presumption. If it is an object that has engaged and eluded the ingenuity and wisdom of men for ages, he will be accused of arrogance in supposing that he alone possesses knowledge superior to the rest of mankind. In endeavoring to persuade his fellow men of his success, he must not only encounter the intrinsic difficulties inseparably connected with every such attempt, by vanquishing or preventing objections which naturally present themselves to the most dispassionate understandings, but he must overcome the objections by which the judgments of men are disturbed at the first glance of such a pretension. The doubts of the sceptic, and the shafts of the satirist, are principles always enlisted against such propositions; for there is an almost uncontrollable propensity to persuade ourselves that what has never been found never will appear, and that nothing but folly would look for it. But while it would certainly be characteristic of weakness to admit any proposition, however gravely or plausibly advanced, without due examination, it no more follows, as a true consequence, that he who proposes it is a wild and visionary projector, than it does that he who ridicules it is a wise and practical philosopher.

The failure of the countless schemes for effecting an *useful* continued motion makes me deeply sensible of the good foundation for the doubts which will attend every plan for such an object, and of the necessity of removing preconceived prejudices. With the view of removing these obstacles I have made the preceding remarks; and I shall now call the attention of the reader to the means by which my plan avoids the errors that have caused the failure of its predecessors. Unlike all the plans of which I have seen or heard, I make no attempt by combining the simple mechanical powers, or by any application of magnetism, galvanism, gravitation, or the other *unvarying* laws of nature, to *create* a moving power, but have simply taken advantage of a well known and ever active, though varying, law of nature, to produce a mechanical effect. My project has occurred to me from a plain process of ratiocination on the principle and uses of the *thermometer*; and is, indeed, nothing more than a modified thermometer on a very large scale, with a more expansible fluid than is commonly used. This is not the first time that the plaything of the philosopher has become an instrument of utility and power in the hands of the mechanic.

It is an axiom of mechanics that "whatever communicates or tends to communicate motion to a body is a mechanical force." It is indisputably admitted that all bodies are enlarged on receiving accessions of heat, and in this process of enlargement they exert a mechanical force, and any obstacle which opposes this enlargement sustains an equivalent pressure. This force, when derived from solids, and more particularly from fluids confined in a limited space, may be produced to almost any degree of intensity, by the simple operation of the changes in atmospheric temperature. From this very simple though obvious source of power, I found my theory of a "perpetual motion"; and which I hope to prove, logically, is incontrovertible in its practical application. To this I may add, that I have constructed a machine, rude, it is true, from the absence in this part of the country of mechanical skill of the kind required, but sufficiently accurate to verify the correctness of the principle.

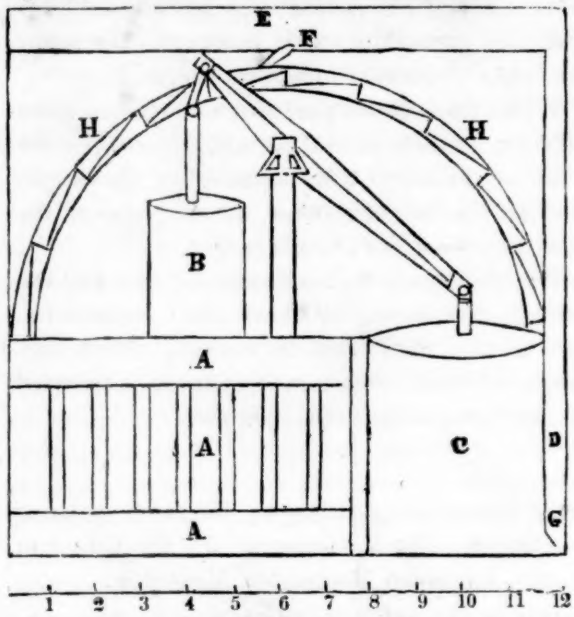
From an examination of a series of thermo-

metric tables, I found that the average change of temperature, or the range of Fahrenheit's thermometer, from the minimum to the maximum, in this country, in the shade, was about fifteen degrees for every day in the year. Experiments on the expansibility of liquids show that ether, alcohol, and the oil of turpentine, (the fluids of the common kind that undergo the greatest changes in these respects,) are expanded six cubic inches in every one hundred cubic inches, on an exposure to an increase of 90° of heat, and consequently sustain an equal diminution of bulk under an equal diminution of temperature. If we employ a gallon of either of those fluids, it will, under the operation of the above laws of nature, undergo an average daily expansion and contraction of 2.74 cubic inches, which, if made to act upon a piston in a cylinder of one inch in diameter, would elevate, and the pressure of the atmosphere would depress it, about three and a half inches daily.

This is the power. It is necessarily of an irregular and intermitting kind, having, with the exception of the numerous daily fluctuations (which would each operate as a moving power) an interval of twenty-four hours between each exacerbation of action; but to convert it into an uniform and continuous motion, there are numerous means obvious to every practical mechanic. The grand object being obtained of moving a piston spontaneously in a cylinder, it will be no difficult matter to apply that power by a working beam, spring, or various other ways, to any mechanical purpose.

In the machine which I constructed, of which the attached figure is a roughly drawn elevation, I have applied the piston to a beam, the farther end of which works a pump large enough to receive thirty pounds of quicksilver. This quantity of mercury is elevated through a tube by the action of the piston, cylinder B, to a cistern twelve inches above the bottom of the pump, and thence is discharged through a graduated orifice, in a small continuous stream (so as to give uniformity of motion) upon an overshot wheel. Reasoning from the comparative incompressibility of fluids, I consider that there is afforded, by the average daily expansion of a gallon of alcohol, and power enough to elevate, not simply thirty, but three hundred or more pounds, of mercury, twelve inches high; while if we give it, as I propose, a practical application to a common clock, the daily elevation of ten pounds will be sufficient to keep it in "continual motion."

It is obvious that the cylinder, &c. must be adapted in length to the varying bulk of the expansible fluid in summer and winter.



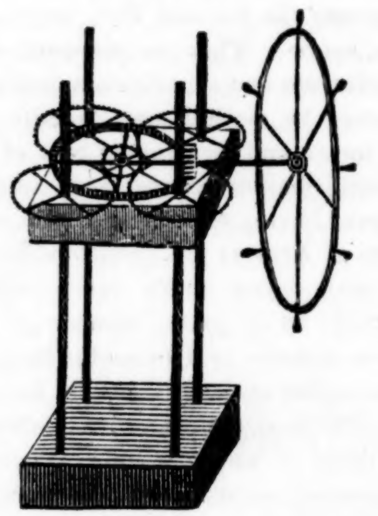
References.—A A A, a vessel consisting of 2 common receivers and tubes, (48,) enough to hold a gallon of an expansible fluid. B, a cylinder with a piston, on which the expansion of the fluid in A, produced by change of atmospheric temperature, is to act. C, a pump, with a valve opening inwards, (not seen in the figure.) D, a tube, up which mercury is to be forced by the pump C, into the cistern E. F, a graduated orifice, for discharging the quicksilver on the overshot wheel, H H. G, a valve, to prevent the retrogression of the mercury into the pump C.

That this principle will fulfil the expectations generally entertained of a "perpetual motion," I do not expect, but that it affords a source of power sufficient for the purpose, I have received a sufficient demonstration; and that it can be made an useful improvement in mechanics, no objection has been presented that gives me reason to doubt. It is as yet scarcely more than an incipient idea, having received but a slight examination of one mind, and that not accustomed to such operations.

Columbia, S. C. March 11, 1833.

We understand that Sir David Brewster has, within this last week, made two very remarkable discoveries, which promise to be of some

use to science. In a new salt discovered by Dr. William Gregory, viz. an oxalate of chromium and potash, he has detected the extraordinary property, that one of its images formed by double refraction is of a bright scarlet, while the other image is of a bright blue color. In examining the pure liquid, any hydrous nitrous acid, prepared in the manner which is supposed to yield it in its purest state, he found that the acid actually consisted of two separate fluids, one of which was heavier than the other, and possessed a much higher refractive power.—When the two fluids were shaken, they formed an imperfect union, and separated again by being allowed to remain at rest. What the second fluid is remains to be investigated. It may perhaps turn out to be an entirely new substance. Its physical properties are now under investigation.—[Caledonian Mercury.]



Mr. Dunham's new Patent Screw Press.—We have been much gratified by an inspection of this new invention, a correct engraving of which we insert, and witnessing its operation in pressing paper, at the office of Messrs. Schols & Co., printers, in this city.

It consists of a cast iron bed, on which are erected four iron columns, with a screw on the end of each; the head or platen is attached to four cog wheels, which move it up and down on the columns—the whole being acted upon by a pinion wheel in the centre, thus moving the platen in a perfectly straight line without the least variation, which is a great improvement on the old presses, producing a reduction of friction, a gain of power, and a saving of machinery. The press in question can be constructed with one to ten thousand tons power or more, retaining all its advantages, and can be worked either by manual or horse power, or by machinery, and is peculiarly adapted to the expressing of oils, the pressing of paper, or any thing requiring a perfectly uniform, gradual, and equal motion.

We are informed that one man can, with this press, perform in the same given time an amount equal to that which requires four men with a bar and capstan press. The whole is composed of iron, and built in a substantial and workmanlike manner by Messrs. Fry & St. John, 87 Eldridge-street, requiring but one-fourth part the space occupied by common presses.

The press can be made of almost any size, and at about the same price, as the old fashioned ones, and which we are of opinion in a very short time it will entirely supersede.

Extracts from Lord Brougham's Treatise on the Pleasures and Advantages of Science.

We have seen how wonderfully the *Bee* works according to rules discovered by man thousands of years after the insect had been following them with perfect accuracy. The same little animal seems to be acquainted with principles of which we are still ignorant. We can, by crossing, vary the forms of cattle with astonishing nicety; but we have no means of altering the nature of an animal once born, by means of treatment and feeding. This power, however, is undeniably possessed by the bees. When the queen bee is lost by death or otherwise, they choose a grub from among those which are born for workers; they make three cells into one, and placing the grub there, they build a tube round it; they afterwards build another cell of a pyramidal form, into which the grub grows; they feed it with peculiar food, and tend it with extreme care. It becomes, when transformed from the worm to the fly, not a worker, but a queen bee.

These singular insects resemble our own species, in one of our worst propensities, the disposition to war; but their attention to their sovereign is equally extraordinary, though of a somewhat capricious kind. In a few hours after their queen is lost, the whole hive is in a state of confusion. A singular humming is heard, and the bees are seen moving all over

the surface of the combs with great rapidity. The news spread quickly, and when the queen is restored, quiet immediately succeeds. But if another queen is put upon them, they instantly discover the trick, and, surrounding her, they either suffocate or starve her to death. This happens if the false queen is introduced within a few hours after the first is lost or removed; but if twenty-four hours have elapsed, they will receive any queen, and obey her.

The labors and the policy of the *Ants* are, when closely examined, still more wonderful, perhaps, than those of the *Bees*. Their nest is a city, consisting of dwelling places, halls, streets, and squares into which the streets open. The food they principally like is the honey which comes from another insect found in their neighborhood, and which they, generally speaking, bring home from day to day as they want it. Late discoveries have shown that they do not eat grain, but live almost entirely on animal food and this honey. Some kinds of ant have the foresight to bring home the insects on whose honey they feed, and keep them in particular cells, where they guard them to prevent their escaping, and feed them with proper vegetable matter, which they do not eat themselves. Nay, they obtain the eggs of those insects, and superintend their hatching, and then rear the young insect until he becomes capable of supplying the desired honey. They sometimes remove them to the strongest parts of their nest, where there are cells apparently fortified for protecting them from invasion. In those cells the insects are kept to supply the wants of the whole ants which compose the population of the city. It is a most singular circumstance in the economy of nature, that the degree of cold at which the ant becomes torpid is also that at which this insect falls into the same state. It is considerably below the freezing point; so that they require food the greater part of the winter, and if the insects on which they depend for food were not kept alive during the cold in which the ants can move about, the latter would be without the means of subsistence.

How trifling soever this little animal may appear in our climate, there are few more formidable creatures than the ant of some tropical countries. A traveller, who lately filled a high station in the French government, M. Malouet, has described one of their cities, and, were not the account confirmed by various testimonies, it might seem exaggerated. He observed at a great distance what seemed a lofty structure, and was informed by his guide that it consisted of an ant hill, which could not be approached without danger of being devoured. Its height was from fifteen to twenty feet, and its base thirty or forty feet square. Its sides inclined like the lower part of a pyramid, the point being cut off. He was informed that it became necessary to destroy these nests, by raising a sufficient force to dig a trench all round, and fill it with faggots, which were afterwards set on fire; and then battering with cannon from a distance, to drive the insects out and make them run into the flames. This was in South America; and African travellers have met with them in the same formidable numbers and strength.

The older writers of books upon the habit of some animals abound with stories which may be of doubtful credit. But the facts now stated, respecting the Ant and Bee, may be relied on as authentic. They are the result of very late observations and experiments, made with great accuracy by several most worthy and intelligent men; and the greater part of them have the confirmation arising from more than one observer having assisted in the inquiries.* The habits of *Beavers* are equally well authenticated, and, being more easily observed, are vouched by a great number of witnesses. These animals, as if to enable them to live and move either on land or water, have two web-feet, like those of ducks or water dogs, and two like those of land animals. When they wish to construct a dwelling place, or rather city, for it serves the whole body, they choose a level ground with a stream running through it; they then dam up the stream so as to make a pond, and perform the operation as skilfully as we could ourselves. Next they drive into the ground stakes of five or six feet long in rows, wattling each row with twigs, and pudding or filling the interstices with clay, which they ram close in, so as to make the whole solid and water-tight. This dam is likewise shaped on the truest principles; for the upper side next the water slopes, and the side below is perpendicular; the base of the dam is ten or twelve feet thick; the top or narrow part two or three,

* A singular circumstance occasioned this in the case of Mr. Huber, by far the most eminent of these naturalists; he was quite blind, and performed all his experiments by means of assistants.

and it is sometimes as long as one hundred feet.* The pond being thus formed and secured, they make their houses round the edge of it; they are cells, with vaulted roofs, and upon piles: they are made of stones, earth, and sticks; the walls are two feet thick, and plastered as neatly as if the trowel had been used. Sometimes they have two or three stories for retreating to in case of floods; and they always have two doors, one towards the water, and the other towards the land. They keep their winter provisions in stores, and bring them out to use; they make their beds of moss; they live on the bark of trees, gums, and crawfish. Each house holds from twenty to thirty, and there may be from ten to twenty-five houses in all. Some of their communities are larger than others, but there are seldom fewer than two or three hundred inhabitants. In working they all bear their shares: some gnaw the trees and branches with their teeth, to form stakes and beams; others roll the pieces to the water; others, diving, make holes with their teeth to place the piles in; others collect and carry stones and clay; others beat and mix the mortar; and others carry it on their broad tails, and with these beat it and plaster it. Some superintend the rest, and make signals by sharp strokes with their tail, which are carefully attended to; the beavers hastening to the place where they are wanted to work, or to repair any hole made by the water, or to defend themselves or make their escape, when attacked by an enemy.

The fitness of different animals, by their bodily structure, to the circumstances in which they are found, presents an endless subject of curious inquiry and pleasing contemplation. Thus, the *Camel*, which lives in sandy deserts, has broad spreading hoofs to support him on the loose soil, and an apparatus in his body by which water is kept for many days, to be used when no moisture can be had. As this would be useless in the neighborhood of streams or wells, and as it would be equally so in the desert where no water is to be found, there can be no doubt that it is intended to assist in journeying across the sands from one watered spot to another. There is a singular and beautiful provision made in this animal's foot, for enabling it to sustain the fatigue of journeys under the pressure of its great weight. Beside the yielding of the bones and ligaments, or bindings, which gives elasticity to the foot of the deer and other animals, there is in the Camel's foot, between the horny sole and the bones, a cushion, like a ball, of soft matter, almost fluid, but in which there is a mass of threads extremely elastic, interwoven with the pulpy substance. The cushion thus easily changes its shape when pressed, yet it has such an elastic spring, that the bones of the foot press on it uninjured by the heavy body which they support, and this huge animal steps as softly as a cat.

Nor need we flee to the desert in order to witness an example of skilful structure: the limbs of the *Horse* display it strikingly. The bones of the foot are not placed directly under the weight; if they were in an upright position they would make a firm pillar, and every motion would cause a shock. They are placed slanting or oblique, and tied together by an elastic binding on their lower surfaces, so as to form springs as exact as those which we make of leather and steel for carriages. Then the flatness of the hoof, which stretches out on each side, and the frog coming down in the middle between the quarters, adds greatly to the elasticity of the machine. Ignorant of this, ill-informed farriers nail the shoe in such a manner as to fix the quarters, and cause permanent contraction of the bones, ligaments, and hoof —so that the elasticity is destroyed; every step is a shock; inflammation and lameness ensue.*

The *Rein-deer* inhabits a country covered with snow the greater part of the year. Observe how admirably its hoof is formed for going over that cold and light substance, without sinking in it, or being frozen. The under side is covered entirely with hair, of a warm and close tex-

* If the base is twelve and the top three feet thick, and the height six feet, the face must be the side of a right-angled triangle, whose height is eight feet. This would be the exact proportion which there ought to be, upon mathematical principles, to give the greatest resistance possible to the water in its tendency to turn the dam round, provided the materials of which it is made were lighter than water in the proportion of 44 to 100. But the materials are probably more than twice as heavy as water, and the form of so flat a dike is taken, in all likelihood, in order to guard against a more imminent danger—that of the dam being carried away by being shoved forwards. We cannot calculate what the proportions are which give the greatest possible resistance to this tendency, without knowing the tenacity of the materials, as well as their specific gravity. It may, very probably, be found that the construction is such as to secure the most completely against the two pressures at the same time.

* Mr. Bracey Clark has contrived an expanding shoe, which, by a joint in front, opens and contracts, so as to obviate the evils of the common process.

ture; and the hoof, altogether, is very broad, acting exactly like the snow-shoes which men have constructed for giving them a larger space to stand on than their feet, and thus avoid sinking. Moreover, the deer spreads the hoof as wide as possible when it touches the ground; but, as this breadth would be inconvenient in the air, by occasioning a greater resistance while he is moving along, no sooner does he lift the hoof than the two parts into which it is cloven fall together, and so lessen the surface exposed to the air, just as we may recollect the birds doing with their bodies and wings. The shape and structure of the hoof is also well adapted to scrape away the snow, and enable the animal to get at the particular kind of moss (or *licken*) on which he feeds. This plant, unlike others, is in its full growth during the winter season; and the Rein-deer accordingly thrives from its abundance, at the season of his greatest use to man, notwithstanding the unfavorable effects of extreme cold upon the animal system.

There are some insects of which the males have wings, and the females are grubs or worms. Of these, the *Glow-worm* is the most remarkable: it is the female; and the male is a fly, which would be unable to find her out, creeping as she does in the dark lanes, but for the shining light which she gives, to attract him.

There is a singular fish found in the Mediterranean, called the *Nautilus*, from its skill in navigation. The back of its shell resembles the hulk of a ship; on this it throws itself, and spreads two thin membranes to serve for two sails, paddling itself on with its feet, or feelers, as oars.

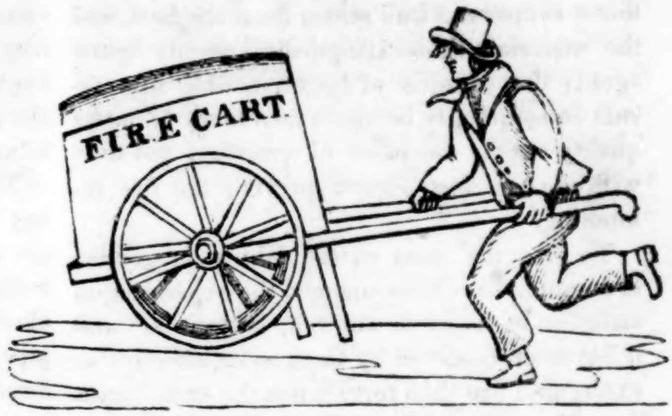
The *Ostrich* lays and hatches her eggs in the sands: her form being ill adapted for sitting on them, she has a natural oven furnished by the sand, and the strong heat of the sun. The *Cuckoo* is known to build no nest for herself, but to lay in the nests of other birds; but late observations show that she does not lay indiscriminately in the nests of all birds; she only chooses the nests of those which have bills of the same kind with herself, and therefore feed on the same kind of food. The *Duck*, and other birds breeding in muddy places, have a peculiar formation of the bill: it is both made so as to act like a strainer, separating the finer from the grosser parts of the liquid, and it is more furnished with nerves near the point than he bills of birds which feed on substances more exposed to the light, so that being more sensitive, it serves better to grope in the dark stream for food. The bill of the *Snipe* is covered with a curious net work of nerves for the same purpose; but the most singular provision of this kind is observed in a bird called the *Toucan*, or *Egg-sucker*, which chiefly feeds on the eggs found in birds' nests, and in countries where these are very deep and dark. Its bill is broad and long; when examined, it appears completely covered with branches of nerves in all directions; so that, by groping in a deep and dark nest it can feel its way as accurately as the finest and most delicate finger could. Almost all kinds of birds build their nests of materials found where they inhabit, or use the nests of other birds; but the *Swallow of Java* lives in rocky caverns on the sea, where there are no materials at all for the purpose of building. It is therefore so formed as to secrete in its body a kind of slime, with which it makes a nest, much prized as a delicate food in Eastern countries.

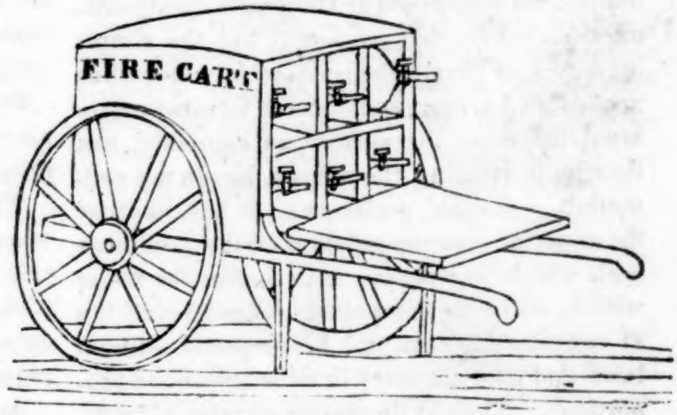
A Plan for the Speedy Extinction of Fires.

[From Captain Manby's Circular to Insurance Companies in England.]

It must be obvious that the ready extinction of fire depends entirely on the facility with which water is brought to act upon it at its commencement; and that, when left uncontrolled during the delay of engines arriving, the procurement of water, and the further delay of getting the engines into full action, it reaches a height at which its reduction is highly doubtful, and at least very difficult. Many instances of destruction by fire have been caused by obstructions to the conveyance of engines to the spot, or from the impossibility of procuring water to enable them to act when they have arrived; and in every case some delay necessarily takes place in preparing the engines, even when water is at hand. It is a well-known fact that many of the great and destructive fires in London and other large towns, where water-pipes are laid, might have been controlled if water could have been obtained in time. In towns not so provided, villages, the detached residences of gentlemen, and other buildings in the country, the want of water at hand, or other means of extinction, makes their total destruction in case of fire almost inevitable.

From observations which I have made in wit-





nessing fires, and from information of those persons constantly employed on such occasions, I am assured that a small quantity of water, well directed and early applied, will accomplish what, probably, no quantity would effect at a later period. This has excited my attempts to provide some prompt and efficient means by which the anxious and often important interval of delay would be obviated, and the fire opposed on the first alarm, thereby not allowing the flames to increase in fury; which so often occurs, that the efforts of the fireman are exerted rather with the hope of preventing the extension of the calamity to other buildings, than to save that in which it first broke out.

To attain this object, I propose a Fire Cart of light construction, requiring but one person to convey it to the spot, and apply a fluid, in the most efficacious manner, from portable vessels or engines, on a principle very long known—the artificial fountain in pneumatics. The engines are to be kept always charged, and one when slung across the body of a watchman or servant is easily carried to any part of the builing, however difficult of access. The management required is simple: for on opening the stop-cock, the pressure of condensed air instantly propels a stream that can be directed with the most exact precision on the part in combustion,—a circumstance extremely important, when the incipient fire is not within the reach of effort by the hand, and when the air, heated by the flames, prevents approach to cast water upon it by common means.

Every fire, even the greatest, must arise from small beginnings, and when discovered in its infant and commencing state, is easily to be kept down and prevented from becoming destructive, if means of early application were at hand. We often hear of the alarm of fire given by watchmen long before the arrival of engines on the spot, and, if they were provided with a fire cart, the alarm of the watch and application of means of extinction would be simultaneous.

The cart contains six engine s, each charged with the impregnated solution of an ingredient best adapted to extinguish fire. When the first engine has expended its store of antiphlogistic fluid, a supply of others in succession may keep up a constant discharge until regular engines and plenty of assistance arrive, should the fire not be entirely subdued by these first efforts.

When a small quantity of simple water is cast on materials in a state of violent combus-

tion it evaporates into steam from the heat, and the materials thus extinguished readily ignite again; the addition of incombustible ingredients consequently becomes necessary to make quality supply the place of quantity, and thus with the smallest portion prevent the fire rekindling.

To give the most extinguishing properties to common water has engaged the experimental attention of many in different countries,* and it has been rendered by them more effective to extinguish fire than forty times the same quantity of common water (a circumstance not speculative, but conformed by trial made upon buildings erected for that purpose); but the simple ingredient of pearl-ash dissolved in water when applied on burning substances, forming an incrustation over the surface extinguished, and thereby preventing the access, has in my estimation a decided preference; it has likewise the superior recommendation of the readiness with which any person may imbue the water with it, while the compounds cannot be had but at considerable cost, nor be prepared without labor and nice accuracy in their respective proportions. Thus at the moderate ratio of twenty times increasing the quality, the cart would convey an extinguishing fluid equal to one tun and a half of common water.

Specification in reference to the Apparatus belonging to the Fire Cart.—Each machine is a strong copper vessel, of a cylindrical form, two feet in length and eight inches in diameter, capable of containing four gallons; a tube of the same metal, of one-fourth of an inch in diameter, curved so that its end is carried to the side of the vessel, with a stop-cock and jet-pipe, the vent of which is one-eighth of an inch in diameter at its top, reaches to within half an inch of the bottom, and is to be screwed so closely into the neck of the vessel as to preclude the possibility of the escape of the air.

Three gallons of water, holding in solution any ingredients* best adapted to extinguish fire, are to be put into the vessel, and then the room remaining for the fourth gallon to be filled with closely condensed air; to effect which, the jet-pipe is to be unscrewed, the condensing-syringe fixed in its place, and the air to be pumped in, to the utmost power of the strength of the vessel to contain it; the stop-cock is then to be closed, condensing-syringe taken off, and the jet-pipe replaced.

On turning back the stop-cock, the condensed air re-acts on the water, and casts it to a height proportioned to the degree of condensation.

That the machine may be more easily carried, where access is difficult, it is put into a leathern case with a strap, and, slung over the shoulders of the bearer, is thus conveyed easily, and then directed with the utmost precision to the point requiring the water.

As directions for the effective arrangement of fire carts in populous places, the following plan I should propose: That at each watch-house, from the time of the watch setting, there should be in attendance a regular fireman instructed in the use and management of the apparatus; and that each parish should be provided with one or more fire carts, according to its extent or number of wards, and the vessels or engines composing the complement of the cart to be kept charged ready for being immediately applied. When watch-boxes or stations are at a considerable distance from the watch-house, some central watch-box should have a single engine lodged ready for application, to be brought on the alarm by the watchman, and delivered to the fireman, who repairs to the spot on the alarm of fire being given with as much expedition as possible. Should the fire have broke out near the depot of the fire cart, the fireman in attendance will take the cart with him, or an engine from it ready to apply; if otherwise, the watchmen will each bring an engine, which the fireman will expend, and by receiving from others their engines, a regularly-continued and well-di-

* 1734. M. Fuches, a German physician, by throwing balls into the fire, containing certain preparations, which burst with violence, instantly quenched the fire.

1761. Zachary Grey used the same process, in which were alum, sal ammoniac, and other saline matters, with water.

In the same year Dr. Godfrey, in a public exhibition in a house erected for that purpose near Mary-le-bone, applied the like ingredients with great success, by the action of confined gunpowder only, which, exploding, dispersed the solution on the materials in combustion, and effectively extinguished the same.

1792. M. Von Ahen, at Stockholm, made numerous public experiments to show the effects of several combined ingredients to render materials entirely incombustible; he is stated to have subdued an artificial fire by two men and forty measures of preparation, that would have required twenty men and fifteen hundred of the same measures of simple water.

In the same year, M. Nil Moshein made many public exhibitions to confirm that combustible materials might be made perfectly incombustible; as also did Mr. W. Knox, of Gottenburg.

* Pearl-ash, dissolved in water, when applied on burning substances, forms an incrustation over the surface extinguished, and prevents that part from reinflaming.

rected stream will be kept up, which, from the early opposition to the fire, will no doubt check the flames, if not entirely subdue the fire; should the distance be considerable, the fireman, aided by a watchman, would convey the cart to a place on fire with as much dispatch as possible.

New-York, March, 1833.

To the Editor of the Mechanics' Magazine:

Sir,—In your last number you have given an account of Russell's Hydraulic Press, copied from the London Mechanics' Magazine, and put forth there as a recent invention. I beg to inform you that I assisted to construct a press on the same principle, in June, 1827, for Mr. Ward, Tallow Melter, in Third street, in this city, where it is now in use, and has been ever since that period. Now I think that sufficient notice has not hitherto been taken of inventions that have been made in this country. I am an old countryman, and I can assure you I have every disposition to do all possible justice to Brother Jonathan, and I do hope that in this instance, as well as in all others that come under your notice, you will not fail to make public the claims the people of this country have for ingenuity and industry in all that appertains to the Useful Arts. There is some trifling difference between the press at Mr. Ward's, and that of Russell's, as described in your last—but nothing that affects the principle; however, on that head you can satisfy yourself by seeing it. I am, Sir, your obedient servant,

A Mechanic from Scotland.

[We have seen the press alluded to by our esteemed correspondent, and certainly it is constructed exactly on the same principle as Mr. Russell's. There are several in operation in this city, but we believe none of them have the railway attached, which is a great acquisition. It does not exactly appear that the Editor of the London Mechanics' Magazine, or his correspondent, Mr. Russell, who claims to be the inventor, has put it forth as a very recent invention. Mr. R. in his letter says, that he "has made and constructed several presses of this description," but he does not make us acquainted with the period when he made the first—although as far as we can gather from his letter he claims the invention. That similar presses have been in use here for the last seven years is quite certain, and, the probability is, much longer. We should be sorry to call in question the claims of Mr. Russell, but we have had several communications of a similar nature to that of *a Mechanic from Scotland*, and most of them claim the invention for America. Our only wish is to elucidate the truth, and perhaps some of our correspondents can assist us in the attempt.—Ed. M. M.]

Gipseys of Granada. From an unpublished work—by the Author of "A Year in Spain." [From the Knickerbacker.]

Cervantes begins his beautiful novel of the Gitanilla, in which he illustrates the pranks of the Gipseys, with the following not very flattering exordium: "It would seem that the Gitanos and Gitanas were solely born into the world to fill the station of thieves. They are brought up among thieves; they study the profession of thieves; and finally end by becoming thieves, the most current and thorough-paced on the face of the earth." The history of our species furnishes no study more singular than that of this unaccountable race, which, emigrating from the east, overran the whole of Europe, and pushed its way onward, not by the force of the sword, but by begging and stealing; and at the same time that they conformed in some particulars of dress, manners, customs, and religion, to the countries in which they settled, in others retained every where a common character, common propensities, and common occupations.

The Gipseys are found in no part of Spain except Andalusia, which, in their soft and lisping Spanish, they call *la tierra de Dios—la tierra de Maria Santissima:* the land of God—the land of the most holy Virgin.—They either live in the ruinous purlieus of the great cities, or else wander from place to place, the women carrying their children naked, slung from their shoulders, or dangling with one arm around them upon their hips. In Andalusia, as elsewhere, they gain their bread by tinkering, stealing, and fortune-telling; and preserve the common tradition of an Egyptian descent. It is in Granada, however, that they most abound, just as the skippers are found in greatest numbers in the best cheese. They have their habitations in the caves of the Albaycin, where they practice little arts in lock and spoon making and basket work, their commodities having the common reputation of being worthless and catch-penny. To vend them, they take their stations in the Vivarambla, where they

may always be seen seated at the shady side of the square, and never shifting their births until dislodged by the sun. Their chief revenue, however, arises from shaving their favorite water dogs, of which there is one in almost every family; and I have often been amused at seeing the four paws of one of these animals, as he impatiently submitted to this process of decoration, held by as many young Gipseys in as many different directions, whilst the old crone their mother divested him of his fleece. These people are almost universally tall and well made, their figures and carriage having in a rare degree the air of freedom and unconstraint. The women are very beautiful, their features, as well as those of the men, being very regular; with an Asiatic complexion and cast of countenance; long, straight, and very black hair; full dark eyes, and teeth of pearly whiteness. They are all fond of appearing in the worn out finery of the Andalusian dandies, and have a taste for elegance, though it be even in rags. Their pranks are often exhibited on the Spanish stage, to the great delight of the audience, who receive their quaint practical jokes and less innocent rogueries with the greatest glee. Indeed, they have the character of being a light-hearted and happy race, and, notwithstanding their vicious propensities, are looked on with an extra share of that indulgence which is extended to vagrants of all classes in Spain.

There is much in the cast of countenance, complexion, and unfettered conformation of these Gipseys, in connection with their mendicant air, and the distinctness of their appearance, character, and sympathies, from those of the Spaniards around them, to remind an American of the vagrant Indians whom he has seen loitering about the frontier settlements of his native country. The Gipseys of Spain do not, however, excite the same sympathy as our unhappy aborigines. They came to that country of their own accord, and with a view to better their condition, bringing their vices with them, and making them instrumental to self support and to the preservation of their identity. But the Indians, instead of dispossessing, are the dispossessed; their degradation, instead of being derived from their savage state, has supplanted the wild virtues that adorned it, and is at once the result of civilized encroachment and the efficient cause of their ruin.

It was in order to see something of the domestic economy of this strange race, of whom we daily meet many in the streets of Granada, that we one morning took a walk to the caves of the Albaycin, where they have their subterranean habitations. Crossing the ravine of the Daro, and passing through the more populous portion of the Albaycin, whose houses are often incorporated with the ruins of walls, that mark the gradual expansion of Granada, as it augmented its population in the days of the Saracens, we began at length to ascend the more precipitous portion of the rival mountain, where it looks towards the valley of the Daro and the fortress of the Alhambra. The Albaycin may be called the rival of the Alhambra, not only from its position immediately opposite, the two mountains being drawn up on either side of the Daro, and frowning upon each other, the pillars of Hercules in miniature; but because in Moorish days it was crowned with a fortress of nearly equal strength, which sometimes arrayed itself in hostility. When two kings reigned, not only in the same kingdom, but in the single city of Granada, it was the fortress of the Albaycin that formed the court and strong hold of Boabdil el Chico. Of this fortress scarce a vestige now remains; it doubtless dates its demolition from the period when, after the conquest, the Moriscos were compelled to take up their abode within the precincts of the Albaycin.

As we went on ascending, the streets of the Albaycin passed gradually into zig-zag pathways, winding their way up the acclivity; and the houses rising above each other along the hill side, gave place to caves artificially hollowed beneath the surface of the earth. The whole superior part of the mountain was perforated like a honey comb, and containing within its bowels a numerous population, of which, however, none of the ordinary indications could be discovered, except the wreaths of thin smoke which rose in every direction, curling among the prickly-pear bushes, which covered the whole surface, and furnished food to the poor inhabitants who lived below. At one of the first caves we managed an invitation to walk in, by asking a decent old woman for some water. When within the door, and we began to recover our sight, we found ourselves in an apartment of regular figure, and wanting in none of the comforts of life. A fire-place stood in front of the entrance, its chimney being perforated upwards through the rock. On the right was the door of the bed-room; it had a circular window or loop hole, was very clean and neat, and was ornamented with crosses, artificial flowers, and rude paintings of the saints.

There were other apartments penetrating farther into the recesses of the mountain, and which received no light from without; these served for sleeping chambers and store rooms. The rock here, like that of the adjoining mountain, which contains the Mazmorras, is of a soft nature and is easily cut, but hardens by exposure to the air. The caves that are hewn in it are more comfortable than the ordinary habitations of the poor, keep out the weather effectually, and being less subject to changes of temperature, are comparatively warm in winter and cool in summer.

Taking leave of our old woman and her cave, we proceeded eastward along the acclivity, until we found ourselves among the more wretched of these subterranean dwellings, the fit abode of Gipseys, vagabonds, and robbers. Having singled out one which we supposed to belong to the first of these honorable classes, from a group of tawny and more than half naked children, whom we found at their gambols before the door, we took the liberty of entering it, after the utterance of an *ave maria purissima.* We found no one within but a young Gipsey girl, seated on the stone floor, surrounded by a litter of straw, which she was sleepily weaving into braid for a bonnet. Beside her was a wild, shaggy dog, which, like those of our Indians, seemed to have adopted himself to the strange life of his masters, and gone back to his original and wolf-like condition. The dog is an accommodating animal; not only in manners, habits, and character, but even in appearance, he learns to assimilate himself to his owner. The dog of a prince takes something of a prince's pomposity; the butcher's dog shares in the butcher's fierceness; the dog of a thief may be easily known by his skulking, hang-gallows air; and that of the poor beggar learns to look as humble and imploring as his master. The theory may fail as often as any other theory; but at all events it applied to the treacherous cur who now growled at our intrusion, until it was sanctioned by his mistress; when, though he ceased his menacings, he took his station beside her, and still kept a watchful and lowering eye upon us. The young woman too seemed embarrassed by our presence; and when we would have our fortunes told by her, she pleaded ignorance, bade us come when her mother should be there, and appeared willing to be rid of us. Ere we relieved her of our presence, we had time to remark that, though neither very clean nor very tidy, she was yet pretty as Preciosa herself. Her features were regular and expressive, with glowing eyes and a form finely moulded and unperverted by artificial embarrassments. She had moreover a modest look, and seemed to justify the idea, that chastity could exist, as it is said to do, in so humble and unfettered a condition. Indeed, whatever may be the vices of the Spanish Gipseys, Cervantes tells us that they respect this virtue both in their wives and damsels, forming none but permanent connexions, which, though not sanctioned by matrimony, are only broken by common consent. He gives them credit too for assuming, in an eminent degree towards each other, the laws and obligations of friendship. They do not take the trouble to pursue crimes committed among them beyond the tribunals of the country; but, like many others in Spain who are not Gipseys, execute justice on their own account.

A LIVING LAMP.—The aborigines of South America, in the *fire-fly*, (the *elater noctilucus*,) had a *living lamp* provided for them by Divine Beneficence, which, supplied from itself, required no art to trim it, no combustible material to feed it. Eight or ten of these insects afford light equal to that of a candle: they illuminate the house—they serve to direct the traveller. On Sir Thomas Cavendish and Sir Robert Dudley landing in the West Indies, they were struck with astonishment at the moving lights of these curious insects in the woods, and, impressed with the idea that the Spaniards were advancing, precipitately returned to their ships.—[The Voice of Humanity, No. X.]

Who first invented Steamboats. By ROBERT LYON. [From the London Mechanics' Magazine.]

In the Penny Magazine of the Society for the Diffusion of Useful Knowledge, there appeared lately an article extracted from an account published at New-York, awarding to Robert Fulton, of America, the right and merit of being the original inventor of steamboats. Knowing as I did the complete falsehood of the thing, I wrote them, and asked them if the dissemination of a notorious falsehood was the diffusion of useful knowledge? If so, I had nothing to add; but, on the other hand, if the correction of falsehood were a matter of any consequence to them (as I give them credit for not wilfully sinning), I would put them right. To make surety doubly sure, I referred them for proof to the

Journals of the Royal Society of London, where they would find ample proof that they were not only doing a very great injustice to their own country, but likewise to the memory and family of the deceased Mr. William Symington, who was the man who had taught Fulton how to construct the machinery to impel vessels by steam.

What then must have been my surprise, Sir, when a Society, at the head of which is Lord Brougham, in place of referring to home documents to correct a most palpable falsehood, after some delay, and in a most flippant manner, replied to my communication by saying, they were content to let the matter rest as it was, as Judge Story's account of the matter from New-York was fully sufficient for them—*the plan of their work not permitting them to sift out the truth.*

Desiring most sincerely, Sir, that right alone should prevail over might, is the wish of ROBERT LYON.

Willowfield, Upper Clapton, Middlesex,
December 24th, 1832.

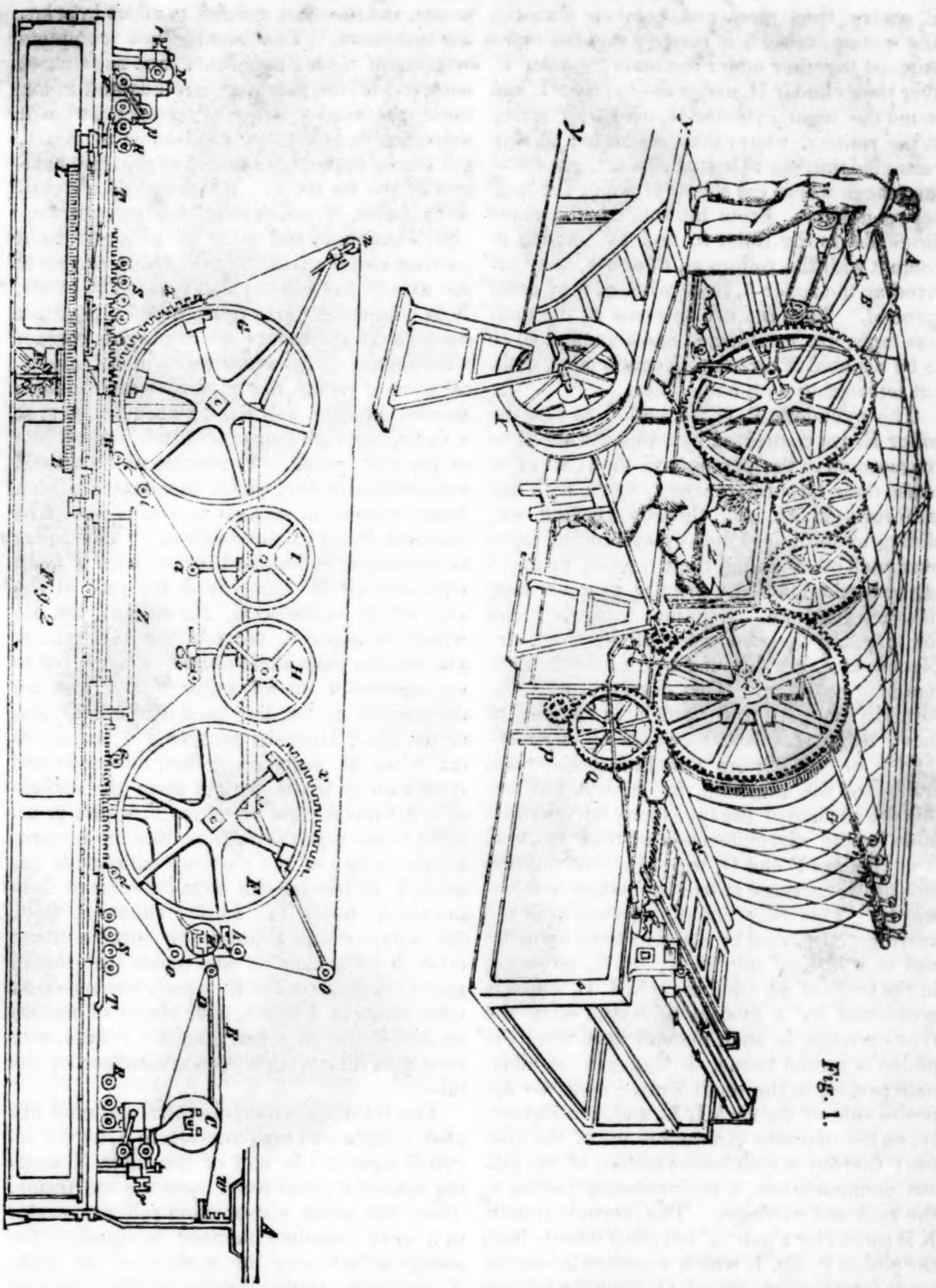
Applegath and Cowper's Improvement on Koenig's Printing Machine. [From Nicholson's Operative Mechanic.]

[We present our readers with a detailed account of this ingenious improvement, which in Europe has attracted the attention of the curious and the learned for a considerable time past. It has been brought into practical operation in many of the large printing offices in London, particularly in newspaper establishments. By it is printed the "Times," "The Morning Herald," "The Morning Chronicle," the "Ballott," the "John Bull," "Observer," "The Penny Magazine," issued by the Society for diffusing Useful Knowledge, (of which 130,000 are published weekly,) and several others of the most popular leading journals, as well as several publications, which, from their extraordinary cheapness, (considering that in England there is yet a consideradle tax on knowledge,) have very extensive circulation. It is an improvement on Koenig's invention, by discarding forty wheels which he had introduced, and he must be a bold man that will say that as much credit is not due to the improvers for the getting rid of these wheels, as to the original projector *for placing them there.*—ED. M. M.]

A perspective view is represented by fig. 1, and a longitudinal section, to explain the manner in which the paper passes through to receive the impression upon both sides, and the mode of applying the ink to the surface of the types by fig. 2. Though in these figures all the material motions of the machine are displayed, yet some of the minute parts, which produce the various movements, have been omitted, in consequence of the diminutive scale of the figures, which is only about one-third of an inch to a foot.

The supply of the blank paper is laid upon a support, or table, A, from whence the sheets are taken, one by one, by a boy, standing upon an elevated platform, who lays them out upon the table B, which has a number of narrow linen tapes or girths passing across its surface. These tapes are formed into endless bands, which extend round the cylinders, or rollers, C and D, in such a manner that when the rollers are turned round, the motion of the tapes will carry the sheet of paper along with them, and deliver it over the roller E, where it is seized between two systems of endless tapes, passing over a series of rollers to keep them extended. These endless tapes are so adapted, in number and position, as to fall between the pages of printing, and also on the outsides, or beyond the margin of the printing; they may, therefore, remain in contact with the sheet of paper on both sides during its whole passage through the machine; by which means, the paper being once received or taken in between the two systems of endless tapes, it will be capable of continuing its motion along with the tapes, in order to bring it into a situation to be printed on both sides, without destroying the register (or coincidence of the pages on the opposite side of the sheet.) F and G represent the two main cylinders, which effect the pressure upon the paper. They are mounted upon strong axes, which turn in stationary bearings affixed to the main frame of the machine. H and I are two intermediate cylinders, situated upon axes between the main cylinders. Their use is to effect the inversion of the sheet of paper, in order to print the opposite side.

We must now describe the manner in which the two systems of endless tapes before mentioned are arranged, to give a clear idea of the operation of the machine. We will suppose one system of tapes to commence at the upper part of the roller E, from whence they proceed in contact with the under portion of the circumference of the main cylinder F; they then pass over the upper part of the intermediate cylinder H, and under the intermediate cylinder I, from whence they proceed to encompass a considerable



portion of the main cylinder G; and by passing in contact with the rollers *a*, *b*, *c*, *d*, and *e*, they arrive again at the roller E, from whence they commenced, thereby forming one of the systems of endless tapes. The other system we will suppose to commence at the roller *h*. They are equal in their number to the tapes already described, and correspond with them also in their place upon the cylinders, so that the sheets of paper may be securely held between them. The second tapes descend from the roller *h* to the roller

E, where they meet and coincide with the first system, in such a manner that the tapes proceed together under the main cylinder F, over the cylinder H, under the cylinder I, and round the main cylinder G, until they arrive at the roller *i*, where they separate; having remained thus far in actual contact, except at the places where the sheets of paper are held between them. From the roller *i*, the paper descends to the roller *k*, and by passing in contact with the rollers *m*, *n*, and *o*, they arrived at the roller *h*, from whence they commenced. Thus the two systems of the endless tapes are established and arranged so as to be capable of circulating continually, without interfering with each other.

The cylinders, P, G, H, and I, as also the roller E, are connected by toothed wheels, as represented in the perspective view, so as to cause their circumferences to move with one uniform velocity, and thereby prevent any sliding or shifting of the two systems of tapes over each other during their motion, as much of the perfection of the printing depends upon this circumstance. Separate forms of types for printing the two sides of the sheet are placed at a certain distance asunder, upon one long carriage. This carriage, with the forms of type secured upon it, is adapted to move backwards and forwards upon steady guides or supporters attached to the main frame of the machine, in such a position that the surface of the types may be operated upon by the circumference of their respective cylinders F and G, to produce the impression as the carriage moves backwards and forwards. This reciprocating movement of the carriage is effected by a pinion fixed upon the end of a vertical spindle K, fig. 2, engaging in the teeth of an endless rack, L L, which is connected by a system of levers with the type carriage, in such manner that, when the pinion is turned round, it engages at alternate periods in the teeth formed upon the opposite side of the rack L L, and, consequently, on the opposite circumference of the pinion; thereby a continuous motion of the pinion communicates a reciprocating motion to the rack and carriage. The verticle spindle K is turned by a pair of bevelled wheels from the pinion P, fig. 1, which receives its motion by an intermediate wheel, Q, from the toothed wheel upon the end of the main cylinder G.

The mechanism for furnishing and distributing the ink upon the surfaces of the types in this machine, is very ingeniously arranged, and performs its operations with great certainty. It is one of the most important points, and the most difficult to effect in printing machines. Two similar and complete systems of inking apparatus, one situated at each end of the machine, are adapted to ink their respective forms of types; we will therefore describe, by references to fig. 1, the inking apparatus situated at the right hand end of the machine. It consists of a cylindrical roller, N, which has a slow rotatory motion communicated to it by a catgut band passing round a small pulley, upon the end of the axis of the main cylinder, G. The roller, N, is adapted to carry down a thin film of ink upon its circumference, by turning in contact with a mass of ink disposed upon a horizontal plate of metal, the edge of which plate is ground straight, and fixed by screws, *r*, *r*, at a small adjustable distance from the surface of the said roller. V represents an elastic composition roller, which is mounted upon a frame turning in an axis *p*, extending across the main frame of the machine. This roller is connected by cranked levers, with a small eccentric circle fixed upon the end of the axis of the cylinder G, (as seen in fig. 1,) which causes it to move round the axis, *p*, and remain for a short period in contact with the surface of the ink roller N, (as seen by the position at the left hand end of the machine, fig. 2,) thereby receiving a portion of ink upon its surface; it then descends and rests with its whole weight upon the surface of a flat metal plate or table, T, which is affixed to the type carriage, so that the reciprocating motion of the carriage causes the ink table T to receive ink upon its surface from the elastic roller V. In this situation, when the type carriage returns, the surface of the table T is obliged to pass under three small elastic rollers seen at R, which are mounted upon pivots in a frame, with liberty of motion up and down, in order that the rollers may bear with their weight upon the surface of the table.

The frame in which they are centered has also a slight end motion given to it, by the inclined form of the end of the table T bearing against a roller fixed upon the said frame. Thus the small composition roller operates in a very complete manner to equalize the supply of ink over the surface of the table T, and by the farther motion of the type carriage, the ink table is caused to pass under four small elastic rollers (seen at S), which in like manner bear with their weight upon the surface of the table (but without end motion), and thereby take up the ink upon their circumferences. The type carriage then re-

turns, for the table T to receive a new supply of ink, and by the form of types passing under the elastic rollers, S, the letters become inked in a very perfect and uniform manner. Whilst the operation of inking the types is going on at one end of the machine, the printing is performed at the other end on one of the sides of the sheet from the types last inked, and *vice versa*. The type carriage is caused to move steadily along with the circumferences of the cylinders F and G, by having racks, *y y*, formed on each side of the forms of types (as seen in fig. 2,) which engage with sectors, or portions of toothed wheels, *x x*, upon the ends of the said cylinders ; at which part the surfaces of the cylinders are covered with a blanket or felt, to give elasticity, and cause them to press equally upon the paper as in ordinary printing presses.

The machine is put in motion by a strap, *y y*, passing round a pulley, X, as seen in fig. 1, upon the axis of which a pulley or pinion is fixed, engaging with the teeth of the large wheel upon the end of the main cylinder G. Thus the various cylinders, with their two systems of tapes, are caused to revolve with a uniform movement in the direction of the arrows (seen in fig. 2,) whilst the type carriage travels alternately backwards and forwards upon its guides as before mentioned.

The operation of printing is performed as follows : The sheets of blank paper are laid one by one upon the table B, so as to bear upon the linen tapes which extend over its surface. In this situation, the rollers C and D are caused to move a portion of a revolution, by the operation of a lever, fixed upon the axis of the roller D, being acted upon by another lever fixed on the cog wheel of the main cylinder F. This motion advances the sheet of paper sufficiently to enable it to be seized between the two systems of endless tapes at the point where they meet each other, or between the rollers *h* and E. As soon as the sheet of paper is carried clear off the table B, the rollers C and D are caused to turn back again to their original position, by the operation of a weight, W, and a cord, *w*, as seen in fig. 2, ready to advance a second sheet of blank paper into the machine. The sheet of paper is carried along between the system of tapes, and applies itself to the circumference of the main cylinder, F, upon the blanket before mentioned ; and by the continuous motion of the cylinder, the sheet of paper is pressed upon the surface of the form of types as it passes under the cylinder by the reciprocating motion of the carriage. —By this means, one of the sides of the sheet receives its impression at the same time that the form of types situated at the opposite end of the carriage is receiving the ink as before described. Now, by the continuous motion of the machine, the sheet of paper advances in company with the endless tapes, round the intermediate cylinders, H and I, until it applies itself to the blanket upon the surface of the main cylinder G ; at which place it will be found in an inverted position, so that the printed side of the sheet is in contact with the blanket, and the blank side of the sheet downwards, which upon meeting with the other form of types at the proper instant, is pressed upon their surface sufficiently to produce the impression. Thus having arrived at the point where the two systems of tapes separate, the printed sheet is delivered upon the board Z, where it is received by a boy and laid upon the pile.

On Calculating by Machinery—Mr. Babbage's Plan. [From Partington's British Cyclopædia.]

The great Pascal was the first who succeeded in reducing to pure mechanism the performance of a variety of arithmetical operations, and a description of the instrument by which he effected this object is to be found in the fourth volume of the *Machine Approuvees* of M. Gallon. In 1673, Sir Samuel Morland published an account of two different machines which he had invented, one for the performance of addition and subtraction, and the other for that of multiplication, without however developing their internal construction. About the same period the celebrated Leibnitz, the Marquis Poleni, and M. Leupold, directed their attention to the subject, and invented instruments for accomplishing the same purpose by different methods. Leibnitz published his plan in the *Miscellanea Berolensia* of the year 1709, giving, however, only the exterior of the machine ; and Poleni communicated an account of his to the same work, but also explained its internal construction. Both of these machines, together with that of Leupold, were subsequently described in the *Theatrum Arithmetico-Geometricum* of the latter, published at Leipsic in 1727. We must not omit to mention the *Abaque Rhabdologique* of M. Perrault, inserted in the first volume of the work which we have referred to above, the *Machines Approuvees*, by the Paris Academy, which contains also an account of a *Machine Arithmetique* of M. Les-

pine, and of three distinct ones of M. Hillerin de Boistissandeau. In 1735, Professor Gersten, of Giessen, communicated to the Royal Society of London a very detailed description of an instrument of this nature which he had invented, and the hint of which, he says, "I took from that of M. de Leibnitz, which put me upon thinking how the inward structure might be contrived." * *

Notwithstanding the skill and contrivance bestowed upon instruments of a nature similar to that we have just described, their power is necessarily but very limited, and they bear no comparison either in ingenuity or magnitude to the grand design conceived, and nearly executed, by Mr. Babbage. Their very highest functions were but to perform the operations of common arithmetic; Mr. Babbage's engine, it is true, can perform these operations; it can also extract the roots of numbers, and approximate to the roots of equations, and even to their impossible roots; but this is not its object. Its function, in contradistinction to that of all other contrivances for calculating, is to embody in machinery the method of differences, which has never before been done; and the effects which it is capable of producing, and the works which, in the course of a few years, we expect to see it execute, will place it at an infinite distance from all other efforts of mechanical genius. Great as the power of mechanism is known to be, yet we venture to say, that many of the most intelligent of our readers will scarcely admit it to be possible, that astronomical and navigation tables can be accurately computed by machinery; that the machine can itself correct the errors which it may commit; and that the results, when absolutely free from error, can be printed off without the aid of human hands, or the operation of human intelligence. "All this, however," says Sir David Brewster, in his entertaining *Letters on Natural Magic*, "Mr. Babbage's machine can do; and, as I have had the advantage of seeing it actually calculate, and of studying its construction with Mr. Babbage himself, I am able to make this statement on personal observation." It consists essentially of two parts, a calculating and a printing part, both of which are necessary to the fulfilment of the inventor's views, for the whole advantage would be lost if the computations made by the machine were copied by human hands and transferred to types by the common process. The greater part of the calculating machinery, of which the drawings alone cover upwards of 400 square feet of surface, is already constructed, and exhibits workmanship of such extraordinary skill and beauty, that nothing approaching to it has hitherto been witnessed. In the printing part, less progress has been made in the actual execution, in consequence of the difficulty of its contrivance not for transferring the computations from the calculating part to the copper, or other plate destined to receive them, but for giving to the plate itself that number and variety of movements which the forms adopted in printed tables may call for in practice.

The practical object of the calculating engine is to compute and print a great variety and extent of astronomical and navigation tables, which could not otherwise be done without enormous intellectual and manual labor, and which, even if executed by such labor, could not be calculated with the requisite accuracy. Mathematicians, astronomers, and navigators, do not require to be informed of the real value of such tables; but it may be proper to state, for the information of others, that *seventeen* large folio volumes of logarithmic tables alone were calculated under the superintendence of M. Prony, at an enormous expense to the French government; and that the British government regarded these tables to be of such national value, that they proposed to the French Board of Longitude, to print an *abridgment* of them at the joint expense of the two nations, and offered to advance £5000 for that purpose. But, besides logarithmic tables, Mr. Babbage's machine will calculate tables of the powers and products of numbers, and all astronomical tables for determining the positions of the sun, moon, and planets; and the same mechanical principles have enabled him to integrate innumerable equations of finite differences—that is, when the equation of differences is given, he can, by setting an engine, produce at the end of a given time any distant term which may be required, or any succession of terms commencing at a distant point.

On the means of accomplishing this, we need make no apology for quoting Mr. Babbage's own words. "As the possibility of performing arithmetical calculations by machinery may appear to non-mathematical readers too large a postulate, and as it is connected with the subject of the division of labor, I shall here endeavor, in a few lines, to give some slight perception of the manner in which this can be done; and thus to remove a small portion of the veil which covers that apparent mystery. That nearly all tables of numbers which follow any law, however complicated,

may be formed, to a greater or less extent, solely by the proper arrangement of the successive addition and subtraction of numbers befitting each table, is a general principle, which can be demonstrated to those only who are well acquainted with mathematics; but the mind, even of the reader who is but very slightly acquainted with that science, will readily conceive that it is not impossible, by attending to the following example. Let us consider the subjoined table. This table is the beginning of one in very extensive use, which has been printed and reprinted very frequently in many countries, and is called a table of square numbers.

Terms of the Table.	A. Table of squares.	B. First Difference.	C. Second Difference.
1	1		
		3	2
2	4		
		5	
3	9		2
		7	
4	16		2
		9	
5	25		2
		11	
6	36		2
		13	
7	49		

Any number in the table, column A, may be obtained by multiplying the number which expresses the distance of that term from the commencement of the table by itself; thus 25 is the fifth term from the beginning of the table, and 5 multiplied by itself, or by 5, is equal to 25. Let us now subtract each term of this table from the next succeeding term, and place the results in another column (B), which may be called first-difference column. If we again subtract each term of this first-difference from the succeeding term, we find the result is always the number 2 (column C); and that the same number will always recur in that column, which may be called the second-difference, will appear to any person who takes the trouble to carry on the table a few terms further. Now, when once this is admitted as a known fact, it is quite clear that, provided the first term (1) of the table, the first term (3) of the first-difference, and the first term (2) of the second or constant difference, are originally given, we can continue the table to any extent, merely by simple addition: for the series of first-differences may be formed by repeatedly adding the constant difference 2 to (3) the first number in column B, and we then necessarily have the series of odd numbers, 3, 5, 7, &c.; and again, by successively adding each of these to the first number (1) of the table, we produce the square numbers."

Having thus thrown some light on the theoretical part of the question, Mr. Babbage proceeds to shew that the mechanical execution of such an engine as would produce this series of numbers is not so far removed from that of ordinary machinery as might be conceived. He imagines 3 clocks to be placed on a table, side by side, each having only one hand, and a thousand divisions instead of twelve hours marked on the face; and every time a string is pulled, each strikes on a bell the numbers of the divisions to which the hand points. Let it be supposed that two of the clocks, for the sake of distinction called B and C, have some mechanism by which the clock C advances the hand of the clock B one division for each stroke it makes on its own bell; and let the clock B by a similar contrivance advance the hand of the clock A one division for each stroke it makes on its own bell. Having set the hand of the clock A to the division I, that of B to III, and that of C to II, pull the string of clock A, which will strike one; pull that of clock B, which will strike three, and at the same time, in consequence of the mechanism we have referred to above, will advance the hand of A three divisions. Pull the string of C, which will strike two and advance the hand of B two divisions, or to Division V. Let this operation be repeated: A will then strike four; B will strike five, and in so doing will advance the hand of A five divisions; and C will again strike two, at the same time advancing the hand of B two divisions. Again pull A, and it will strike nine; B will strike seven, and C two. If now those divisions struck, or pointed at by the clock A, be attended to and written down, it will be found that they produce a series of the squares of the natural numbers; and this will be the more evident, if the operation be continued further than we have carried it. Such a series could of course be extended by this mechanism only so far as the three first figures; but this may be sufficient to give some idea of the construction, and was in fact, Mr. Babbage states, the point to which the first model of his calculating engine was directed.

In order to convey some idea of the power

of this stupendous machine, we may mention the effects produced by a small trial engine constructed by the inventor, and by which he computed the following table from the formula x^2+x+41. The figures, as they were calculated by the machine, were not exhibited to the eye as in sliding-rules and similar instruments, but were actually presented to it on two opposite sides of the machine, the number 383, for example, appearing in figures before the person employed in copying. The following table was calculated by the engine referred to:

41	131	383	797	1373
43	151	421	853	1447
47	173	461	911	1523
53	197	583	971	1601
61	223	547	1033	1681
71	251	593	1097	1763
83	281	641	1163	1847
97	313	691	1231	1933
113	347	743	1301	2021

While the machine was occupied in calculating this table, a friend of the inventor undertook to write down the numbers as they appeared. In consequence of the copyist writing quickly, he rather more than kept pace with the engine at first, but, as soon as five figures appeared, the machine was at least equal in speed to the writer. At another trial, thirty-two numbers of the same table were calculated in the space of two minutes and thirty seconds, and as these contained eighty-two figures, the engine produced thirty-three figures every minute, or more than one figure in every two seconds. On a subsequent occasion, it produced 44 figures per minute; and this rate of computation could be maintained for any length of time.

It may be proper to add, that Mr. Babbage stated to the editor of this work, that he considered the powers of his machine as scarcely at all developed—indeed, that the automaton was yet but in its infancy. If such be the childhood of this gigantic engine, what may we not expect from its maturity? There is a general belief that this gentleman has received a large parliamentary grant as a reward for his invention;—this is, however, a vulgar error. He has superintended the construction of the instrument at the expense of the Government, but he has not directly or indirectly received the slightest pecuniary compensation for his services.

Education universally extended throughout the community will tend to disabuse the working class of people, in respect of a notion that has crept into the minds of our mechanics, and is gradually prevailing, that manual labor is the only source to wealth. James Watt and Robert Fulton were worth more to society than five hundred thousand hedgers and ditchers.—[Cooper on Political Economy.]

The Mechanical Arts.—Next to Agriculture, in point of necessity and usefulness, should be regarded the arts of mechanism. Who is more deservedly entitled to our respect and a rich pecuniary reward, than he who can so control the properties of motion, and calculate velocities so as at once almost to annihilate time and space? than he who is enabled, by the force of the elements themselves, to convert all, that is within reach in nature, to the most advantageous purposes—either to assist man in his enterprises, by supplying his weakness, or to satisfy his wants, or contribute to his convenience?

While our country abounds in the variety of materials necessary to be wrought by the ingenious mechanic into labor-saving machines, and while this supply of materials affords him, of ever so humble means, the required facilities of accomplishing the most surprising works within the compass of human agency, it offers, also, a stimulus to the capitalist to encourage the highest degree of perfection in machinery, for the economy of labor, of which the modifications of the mechanic powers are susceptible.

The vast extent of our territory; its cheap and luxuriant soil, inviting by the salubrity and variety of its climate, to all who may choose the honorable calling of husbandry, with a sure promise of a rich reward, renders nugatory the objections of some, that human labor will be out of demand. In this government, at least, while the best of wild lands, at a nominal price, are accessible to all, industrious and ingenious mechanics will never go unrewarded because machinery is too plenty. —And no other country offers the same reciprocal assurance of success in the cardinal pursuits of human industry; the field of our agriculture has no known limits; our commerce, resting on the industry and enterprise of a republican people, looks boldly to countries the most remote; while the motto over the entrance of our manufactories is "Onward." Already may it be truly said of the American Mechanist, as it was by the Grecian—Give him but a fulcrum and he will move the world.

With the ardent mechanist, a thorough knowledge of mechanical laws, and a power of referring effects to causes, and vice versa,

which always depend upon and lend to each other reciprocal aid, is the basis of improvement and discoveries; and a judicious adaptation of materials, and a scientific combination of forces, constitute the perfection of his art.—[Syracuse Argus.]

Locomotion without Steam.—On the 23d of last month, Mr. Hoffman, an engineer of Dantzic, made a first experiment with his newly invented machinery for driving paddle wheels without the application of steam.—Several friends accompanied him in his trip, which his little vessel performed to admiration, though at a somewhat slow rate. We are told that the mechanism, by which the wheels are impelled derives its power from quicksilver instead of steam.—[Morning Herald.]

Taylor's Patent Improvements in the manner of hanging and effectually securing the Rudders of Vessels. [Communicated by the Inventor for the Mechanics' Magazine.]

These improvements in the manner of hanging and effectually securing the rudders of vessels render their rising and unshipping impracticable, and less liable to injury, and to be used with much less physical power on the wheel or tiller. Their superabundant weight is materially diminished, and rendered more effective for their easy and proper action. These improvements combine a powerful principle of union in their scientific simplicity of construction, and great utility, strength, and durability, in their practical operation: all which are of paramount importance for the proper government and safety of navigable vessels. These improvements are illustrated by reference to the respective sketches and figures, and the following is a description of their construction and application, viz:

Fig. 1.

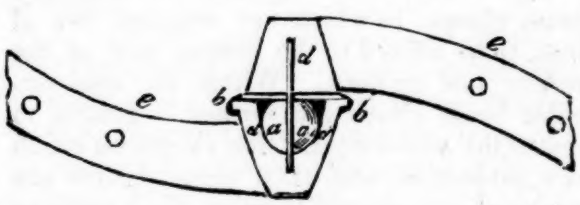


Fig. 1 is a section of a brass cup or joint, in which is formed a hemispherical socket, in working order. The following is a description of its parts, viz:—*a a*, a spherical bearing, in the centre of which is a groove for oil; *b b*, the recess, which contains a leather collar; *d d*, the hemispherical cavity, which contains the spherical bearing, (*a a*,) and also the fluid necessary to lubricate its surfaces, and thereby prevent friction; *c*, shows the groove, formed in the spherical bearing, which permits the fluid to flow up, and lubricates its surfaces every time the ball is moved; *d*, shows the groove, formed in the upper joint for the reception of the lubricating fluid; *e e*, elliptical straps.

Fig. 2. Fig. 3.

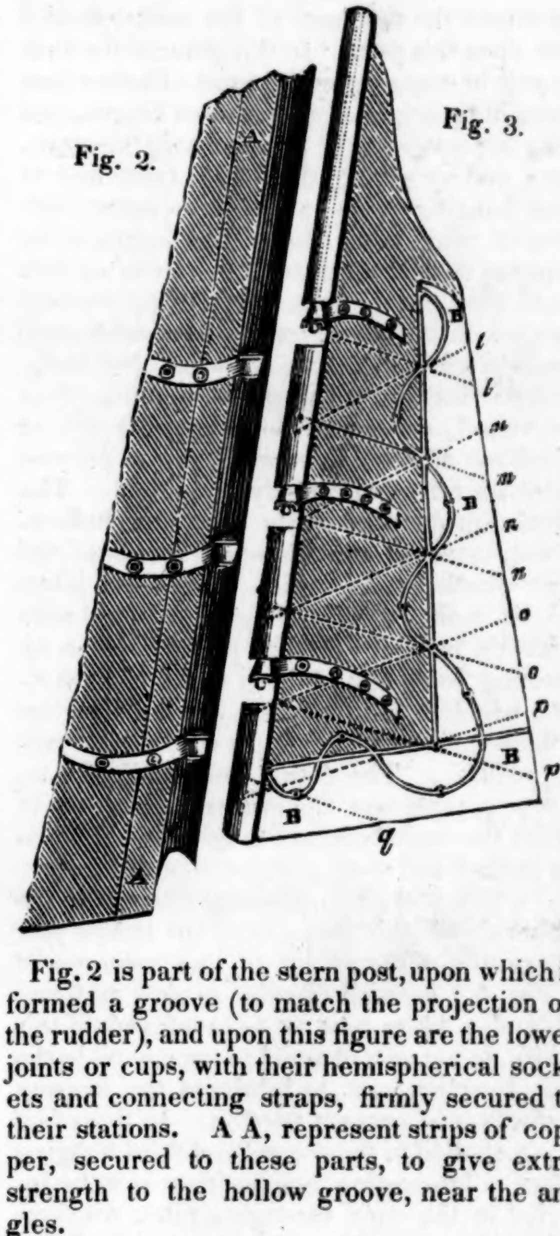


Fig. 2 is part of the stern post, upon which is formed a groove (to match the projection on the rudder), and upon this figure are the lower joints or cups, with their hemispherical sockets and connecting straps, firmly secured to their stations. A A, represent strips of copper, secured to these parts, to give extra strength to the hollow groove, near the angles.

Fig. 3 is the rudder, with its projection (to fit the groove in the sternpost), and attached to which are the upper joints with their spherical bearings; when these balls are let into their stations, (see fig. 4,) this projection will fill the groove in the sternpost, and a hinge will thus be formed for the rudder to play or turn upon, of the *strongest*, *easiest*, and *mo*

durable kind. From the accuracy of the bearing surfaces they will perform their action with peculiar *facility*, and as the upper and lower joints are so correctly fitted together they will exclude the entrance of water, or other substance liable to injure or obstruct them. The projection of the rudder entering the corresponding cavity in the stern post will preserve an even surface with the sides of the stern post, reduce the passage and pressure of water acting on the inner surfaces, and lessen the exposure of the rudder from a blow upon this part. In this manner the rudder will be hung upon the most effective and powerful principle of all joints or hinges, and in the nearest possible position with the stern-post; and by giving the straps (attached to these hanging joints) an *elliptical curve*, with circular projections thereon, to increase the diameter and strength of the screw, or bolt heads, (and likewise the straps,) they are held together in the *strongest* and *most substantial manner*, and the rudder is, when thus hung, perfectly secured against a separation from the vessel, except by being unshipped, or raised out of the joints or hinges, to prevent which an effectual remedy is applied. The circular projections on the straps are hollowed out, to admit suitable screw heads of the same diameter, by which means the joints can be more easily stationed and fitted with *accuracy*, in their centrical positions, than by inserting *bolts*, and striking them to form rivets, which has a tendency, by the *vibration* of blows, to throw the joints out of their proper position. The dotted lines marked *l*, *m*, *n*, *o*, *p*, *q*, represent the *diagonal* direction in which the main bolts are to be driven, both in the rudder and stern post, (in lieu of horizontal,) which will give additional strength to the timbers. Within that part of the rudder post where the lever is let in, (as represented in Fig. 5,) a small circular groove is formed, and a brass tube is to be affixed in this cavity, to act as a channel to convey oil to the first hanging joint, to lubricate the bearing surfaces, and prevent friction. In lieu of oil being applied to the second and third hanging joints, a lubricating composition is to be inserted in the cups, through a tube, previous to hanging the rudder; this composition being heavier than water, a portion will remain in the cups after the rudder is shipped, and will diffuse itself to the bearing surfaces, and throw off friction. The introducing this lubricating composition in lieu of oil is in consequence of these hanging joints being constantly under water, and therefore precluding the insertion of oil to the cavities assigned for that fluid. The bearing surfaces of the hanging joints are not exposed to the violent and irregular action of the water, which would, in some degree, impede their motion, and create additional physical power to guide the helm; neither are they liable to the corrosive operations of rust, or other injurious causes, which now arise from the present mode of hanging ships' rudders.

On that part of the rudder marked B B B, is formed a projection, to receive a corresponding groove, formed in a wing of *cork*, to be attached and secured to it.

From the *elastic* and *buoyant* properties of cork, it will not only create the *first impetus*, or *spring*, to facilitate the action of the rudder, but will operate something like the tail of a fish, in governing the motion of its body,—will also reduce the superabundant weight of the rudder, and render it more easy and natural to perform its working operation. Another wing of cork is secured to the bottom part of the rudder, to act as already described, and to operate as a repulsive power, to preserve the rudder from injury, by the concussion of a blow that may strike this elastic substance.

The serpentine figure, with bars running through the centre of the rudder, is called the *guard*, which, secured on each side of the wings of cork and the rudder, gives *additional strength* and *security* to the rudder, and will preserve its hanging appendages from accident, as well as operate as a *repulsive* power to prevent injury.

Fig. 4.

Fig. 4 shows two sections of semi-circular brass clasps, to which are attached two of iron, to be affixed to the bottom part of the rudder post on deck. Within the semi-circular brass clasps are formed a groove to match the semi-circular iron clasps, on which is a projection, and when these figures are stationed and secured together, their surfaces will operate in mutual concert, something similar to a hinge, and act in conjunction with the rotatory motion of the rudder. It will also form a *rest*, *bearing*, and *guide*, for the upper part of the rudder. From which arrangement the following benefits will result: First,

it will materially ***sustain the weight*** of the rudder, and ***relieve*** the joints or hinges of their ***burthen***. Second, it will effectually ***prevent*** the rudder from *rising* and *unshipping*. Third, it will form a ***bearing*** near the tiller, which communicates the motion, and keep it ***steady***, and (in conjunction with the ease of the joints or hinges, and other important advantages) will *greatly lessen* the *power* and ***labor*** of its motion, so that the steersman's toil will be greatly reduced, and he can guide the helm to the respective points of the compass with great *facility and ease*, and thus steer the vessel *accurately* in its course. Two small circular cavities are formed in the two brass semi-circles, affixed to the rudder post, to admit oil, to lubricate the bearing surfaces, and prevent friction, this fluid will run into the grooves formed in the bearings of the brass and iron semi-circular clasps, and diffuse itself to the parts in contact.

Fig. 5.

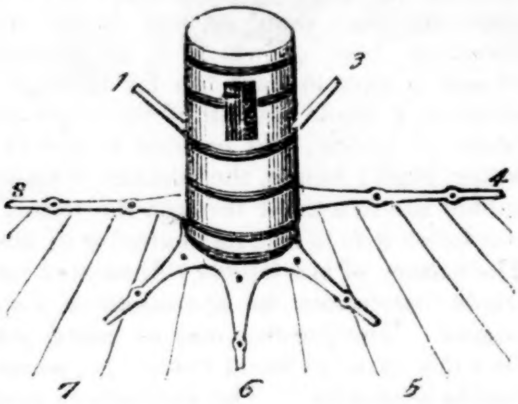


Fig. 5 is a perspective view of the parts complete, affixed to the rudder post on deck, which is secured by elliptical straps, three of which, marked 1, 2, 3, are to be a little elevated, and secured to the stern post and timbers adjoining. Those marked 4, 5, 6, 7, 8, to be secured by being let into the floor of the deck with screws. On the post is represented circular iron binders, and mortice for the lever.

Mr. Torrey's Patent Safety-Apparatus for preventing the Explosion of Steam Boilers. Communicated by the Inventor for the Mechanics' Magazine and Register of Inventions and Improvements.

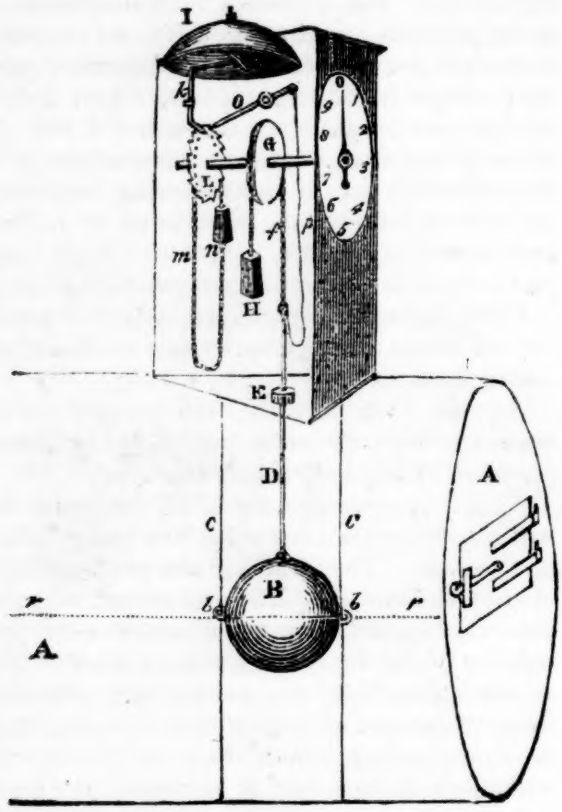
In consequence of the great destruction, both of lives and property, occasioned by the explosion of steam boilers, and the collapsing of their flues, it has been a subject of universal inquiry to find some method through the operation of which these disasters may be obviated; and that public excitement has become so excessive in the United States that the Executive of our General Government has issued a request to all scientific persons conversant with the subject, to send to the Secretary of the Treasury such information, or suggestions, as they may deem serviceable to explain the causes of these disasters, and the probable mode of preventing them. From all that can be gathered through the best of sources, and from engineers themselves, it is fully admitted that if the following requisites are strictly adhered to, there need be no apprehension of danger, either to life or property, from the operations of steam boilers :

First, Ascertain by experiment the pressure of steam which a boiler and its flues can safely sustain ;

Second, Graduate the safety-valve so as always to be sufficiently within the *maximum* pressure of the boiler and its flues.

These precautions, faithfully attended to, will render steam as safe a power as any other now in use. The third and last precaution is, to keep the boiler at all times *sound*, when in use. Generally, from the diminutive circumference of the flues, when compared with that of the boiler, they can sustain more pressure from the steam acting on their outside, than the boiler within which they are placed can withstand inside ; yet it is found that there have been more flues collapsed in boilers than there have been boilers exploded. Why should this be? The answer is, the metal of the flues must, from some cause, have sustained an injury. How can this injury accrue? The only reason apparent to the mind is, that the tops of the flues were left uncovered by the water ; thereby permitting the heat within them to burn and weaken the metal of which they were composed—consequently, the want of a sufficiency of water in a boiler, whether with or without a flue, or flues, is the cause of a collapse. The same argument will apply to the boiler itself, provided the fire applied outside rises higher than the water within ; therefore, agreeably to this reasoning, it must be inferred that if a boiler be proved strong enough to sustain a certain pressure, and the safety-valve is sufficiently loaded within that force, that the only cause why a boiler should explode, or a flue collapse, is from the want of a due quantity of water in the boiler. An engineer cannot tell the precise height of the water by the guage cocks, even should he be trying them all the while ; for water will fly up when the cock is open, although above the water's level.

Viewing the importance of the foregoing considerations, and the darkness now surrounding the subject, the following apparatus has been made and applied successfully to a steam boiler in a steamboat:



References.—A A, a cylindrical boiler, and *r r*, the water line inside of it; B, a globular float, intended to move perpendicularly—for which purpose it has two or more rings, *b b*, affixed to it, through which the rods *c c* pass, being made fast at their ends at the top and bottom of the boiler; D, a straight rod, or piston, the lower end of which is attached to the float B, and the upper, after passing through the stuffing box, E, on the top of the boiler, is fastened to one end of the chain *f*, which passes over the wheel G—on the other end is hung the weight H; I, is an alarm bell, and *k*, the tongue or hammer which rings the alarm; L, a wheel which communicates with the hammer *k*, and over which the chain *m* is placed, to which the weight *n* is hung; O, a ketch communicating with the top of the rod D, by the cord *p*.

Of the fact that this apparatus will give the true height of the water in any boiler, and thereby give sure warning of impending danger to the lives and property of all near about, whether on board of the boat, or elsewhere, there is no doubt; but this is not the only advantage resulting from the application of it, which the following remarks will amply demonstrate.

In order to generate the *maximum* of steam from a definite quantity of fuel, there is one thing to be observed—which is, the principle regulating the power. *Ice* and *caloric* are the material of steam. Ice is the mere body *acted on;* caloric is the *operator*. This great mover must be dealt with in an economical manner, for the expense of water is but trifling, and fuel is high. To instance a component of steam: it forms at the bottom of the boiler in the shape of a bubble—now, in order to produce this bubble, a certain quantity of caloric is received, *more* than is requisite to raise the temperature to 112 degrees Fahrenheit, which super-abundant heat is termed *latent*. This bubble rises through the water, which, in temperature, is below the evaporable point, at the ordinary pressure of the atmosphere; and in its ascent, from the difference of its and its surrounding water's temperature, loses more or less of the superabundant heat of which it is possessed. Should it have to pass too far through this element, it would lose all of this super-abundance of caloric, and become a part of the water itself; hence, the shorter distance a bubble has to ascend through the water, the less liable it is to lose its character of steam. The history of one bubble will answer for the whole that causes the operations of a steam engine. The question may be asked, where does this extra or latent caloric go, when the bubble liquidates? The atmosphere passing around the sides of the boiler will answer for the fact.

Granting every thing in readiness, and the height of the water in the boiler at the level *r r*, it is evident that if the water falls the float must fall likewise, (always supposing the friction to be not too great for the weight or buoyancy of the float to overcome,) drawing the weight H up, and turning the wheel G, which moves the hand on the dial plate, which, by its figures, denotes the rise or fall of the float B, and the rods *c c* oblige it to move perpendicularly. The alarm can be given at any height of water for which it may be set, for the cord *p*, when tightened, loosens the ketch *o*, and the cord *p*, as it falls, stretches that cord; therefore, when the water has descended so far as to be considered dangerous, and the time of alarm is set at that point, the ketch *o* is sprung; the wheel L, then being at liberty to turn, is caused to revolve by the fall of the weight *n*, hung to the chain *m*, and this turning

of the wheel L vibrates the tongue or hammer *k*, and the alarm is given. When the water rises, the float will necessarily raise with it, and the distance be denoted by the figures 1, 2, 3, &c. on the dial plate. A spring, or rack and pinion, can be substituted for the weight H, should either be preferred.

[Of the utility of Mr. Torrey's invention there cannot exist a doubt in the mind of any reasonable person. Most of the accidents that have occurred in steamboats have been occasioned by the bursting of the boilers, and to find an effectual remedy for preventing a recurrence of similar disasters, has engaged the attention of practical and scientific men for a series of years. Mr. Torrey's plan, it appears to us, is an effectual one—it is so simple that it is almost incredible that it has hitherto escaped the notice of those whose avocations must bring the subject daily and hourly under their immediate notice. —The invention has been deemed of sufficient importance by several gentlemen to form a joint stock company for carrying into effectual operation the plan. The apparatus as above described has been placed by them on the *Delaware*, steamboat, plying between this city and Providence, and experiments have been made in the river, that leaves no doubt of the complete success of the undertaking. In a few days she will make her first trip, and we trust that in our next we shall be enabled to give a satisfactory account of its practical operation.—Ed. M. M.]

Experiments in Canal Steam Navigation. By R. G. M. [From the London Mechanics' Magazine.]

Mr. Editor,—It may be deemed very imprudent for an individual with small means to attempt propelling a canal boat by steam, especially when there are many persons in his neighborhood more competent to the undertaking, having more money and better conveniences for the purpose. I well knew, however, that though their means and appliances were ample, they had more lucrative and agreeable channels wherein to apply both. With this impression on my mind, and having no employment for a small steam engine which I had by me, I commenced the experiment which I beg now to relate.

Selecting an old heavy-sailing canal boat, I tried several kinds of paddles placed in various situations of the boat, repeatedly altered the machinery, and travelled several voyages with her myself, the last of which was about five miles in three hours on the Birmingham canal, with twenty tons long weight on board her, exclusive of the machinery. With this heavy-sailing old canal boat, an engine, not built for the purpose, and machinery put together in a country place, where no such workmen or tools can be had as are to be found in large manufacturing towns,—with these disadvantages I have performed that voyage by steam alone, without the aid of any other power. By this dearly bought experience, I am in possession of the dimensions and capacity of every article necessary—the limits of the projection of the machinery and guards, above, below, and on the sides of the vessel, so as to clear locks, bridges, slopes, and other boats and lines, with the precise strength of the engine required to propel a boat at the utmost speed which the depth of canal will admit. I can, therefore, confidently state *that canal boats can be propelled by steam* to answer every purpose, except short voyages and frequent loading, up and down any locks, without injury to the canal banks, without injury to other craft, with the same manual labor, and with about five shillings in fuel for a hundred miles' voyage. The charge of steam navigation being injurious to the canal banks must have originated in error, or perhaps from prejudice, before the railroad system had been proved: for my own part, if I wanted to lessen the damage now done to the canal banks and other boats, I would propel them by steam instead of tracking by horses. In fact, any person acquainted with the business of a canal will acknowledge that a horse draws in an indirect line, while the steerer to keep his vessel straight, puts the helm to the opposite side, which causes a heavy surge, and this is much increased in windy weather, and with an increased speed still more; while a steamboat glides sweetly and majestically through the water, the paddles heaving in a direct line always ahead. With regard to speed, it must be in proportion to the shape of the boat, the quantity of lading on board, and the depth of water; and, generally speaking, the depth of canals is not such as to admit of a very great rate of speed, because, if a power sufficient were applied to a boat heavily laden, she would soon drag on the bottom. But it must be remembered, that if a horse draws a boat at the rate of seven miles an hour, that boat and horse, at the end of an hundred miles voyage, would be more than 20 miles behind one propelled by steam at

the same rate, since passing the lines of other boats, and thus letting down the boat's momentum, would cause this difference.

At some cost, and much labor, I have enabled myself to state these facts, but at present I must lay my boat and engine aside, from necessity, however, not choice. If there be any thing in my experience acceptable to a more competent adventurer than myself in so laudable an undertaking (for it wants only competence), so as not to leave it in the hands of monopoly, I would gladly afford every information in my power.

December 13, 1832.

THE CHIRAGON, OR GUIDE FOR THE HAND.—Mr. Wm. Stidolph, a schoolmaster at Blackheath, has invented an apparatus to which the name of Chiragon is given; by the assistance of which, a person who has become blind after learning the art of writing, may continue his practice without the risk of confounding words or lines together. It consists of a frame, with a raised margin, upon which margin is placed a narrow piece of wood, having a groove to receive a corresponding key that is attached to a collar or bracelet for the wrist. In the sides of the frame series of notches are cut, into which the grooved piece of wood is placed successively so as to form the regular intervals between the lines, whilst the hand is permitted by the collar to pass freely from the left to the right, but is confined to certain limits in its action up and down, or in the direction of the length of the paper used. The writing is effected with Mordan's patent pencils; and we have proved the efficiency of the invention, by writing a letter with its guidance while our eyes were bandaged so as to exclude the sight of every object.—[Athenæum.]

MONTHLY ANALYSIS OF THE CONTENTS OF SCIENTIFIC PERIODICALS.

The *London Mechanics' Magazine*, for December, contains much valuable matter—some of which we shall insert in our next number. There are no less than six attacks in it on the publications of the "*Society for diffusing Useful Knowledge*," from various correspondents of the work; and added to these the Editor has inserted his remarks, on what he calls the "*one sided treatises on Sciences*," put forth under their sanction. The communication signed Samuel Downing, Cabinet-Maker, on the "education of the working classes," is really excellent; it is couched in eloquent nervous language, and will well repay an attentive perusal.

Mr. Baddeley's letter on Martin's improved Frictionless Pump, for which Mr. Shalders has obtained another patent, is good—as indeed are all communications from the pen of that gentleman. Mr. B. contends that the new patentee can claim no exclusive right to his invention, and in that opinion "Mr. Hebert, the talented Editor of the Register of Patent Inventions," concurs. He observes, "this *new invention* is one of the *oldest* contrivances we ever met with in the specification of a patent. The patentee has, we hope, found it to answer his purpose, and we dare say has felt infinite satisfaction in his discovery; but in *attempting to secure to himself*, by patent right, the exclusive privilege of using the machine, we fear he has *expressed* more money out of his pocket than will ever *gravitate* into it again from the same source."

Another claimant for the merit of making some of the *first British experiments in Steam Navigation*, has come forth in the person of Mr. W. Symington, Jun., (for his father.) Mr. S. states that the "*first public trial of steam for a useful purpose in navigation*" was made by his father on Dalswinton Lake, in Dumfreeshire, in 1788—and repeated on the Clyde in 1789. An engraving of the boat accompanies his letter.

Mr. John Bate, the celebrated Mathematical Instrument Marker, of Cornhill, London, has obtained a patent for what he calls "an improvement, or improvements, on machinery applicable to the imitation of medals, sculpture, and other works of art executed in relief." This in fact is no more nor less than a revival of Mr. Asa Spenser's invention, (of the firm of Draper & Co., Bank Note Engravers,) of Philadelphia. The engravings with an excellent description by Mr. Hebert, from the Register of Arts, we shall give in our next; as also, Mr. Robert Mudie's really Philosophical Treatise on Dry-Rot—which is written in that singular original style which pervades all his writings.

The London Repertory of Patent Inventions, for February,, contains an excellent account of an improvement in the construction of Iron Railways with plates, which we shall publish in our next number.

The rest of the number is mostly made up of accounts of American patents and inventions. Among them is a description of an

alarm to be applied to the interior flues of steam boilers, by Dr. Bache, of Philadelphia. It is very ingenious, but we think Mr. Torrey's invention (described at page 153 of this Magazine) is more simple, and will prove more efficacious.

The Journal of the Franklin Institute, for February, contains the Report of the Franklin Institute for the year ending January 17, with a list of managers and other office bearers. It consists principally of an account of the changes made in their Hall, but leaves the public in ignorance of the total number of members of which the Institute consists. It appears, however, that it is in a prosperous state.

It also contains an excellent report made to the Washington City Lyceum, by the learned editor Dr. Jones, on the question, "*Are there any trades so injurious to health, or so hazardous to morals, that they ought, for that reason, to be discouraged or abandoned?*"

The Doctor enumerates the pernicious effects arising from several employments—among the most striking of them we will select that of the needle pointer:

"Of the persons engaged in the pointing of needles, very few indeed reach the age of forty years, by far the greater number dying under that of thirty-two. The fine particles of steel which are ground off are so light as to float in the air, and are so copiously deposited upon the mouth and nostrils as completely to blacken them; much irritation is produced by them in the lining membrane of the nose, and at first a copious mucous discharge is produced from it; but afterwards, the irritability of the parts is exhausted, and they become perfectly dry. The trachea, or wind-pipe, is next affected; respiration becomes difficult, and an habitual, exhausting cough is produced. Soon, nearly all the animal functions are disturbed, the digestive organs refuse to perform their offices, and the lungs, in particular, become the main seat of that total derangement of the whole system which must soon terminate in death. To find a man who has followed this trade for twenty years is almost impossible.

"I have introduced the pointing of needles as an example of the deleterious effects of the fine dust of steel, but the like evils are experienced in the making of a great number of other instruments of iron as well as of steel. Forks, for example, are finished by what is called dry grinding; that is, by grinding them upon a stone without water. Numerous utensils, also, of cast iron, when finished on the dry stone, or by fine files, give out a dust producing all the effects which I have described, and in an equal degree. To put a youth to these businesses, therefore, is to bespeak for him an early grave; yet, society wants and must have the articles, and there is no more difficulty in inducing men to follow these trades than there is in enlisting them for the purpose of being killed, *secundum artem*, in the army or the navy; especially if they are to receive a few pence per diem more for this than for some other species of labor."

The concluding remarks will shew the view of the question Dr. Jones has taken:

"In a despotic government, where human life is held cheap, a tyrant may compel an individual to wear an iron mask, without offering a reason why, but in a free government, where the life of every citizen ought to be accounted of inestimable value, the only mode of inducing a man to wear one for his own benefit, as well as to do many other desirable and proper things, is to give to him that degree of education which shall elevate him in his own opinion, and induce him to act from motives more worthy his intellectual nature than those which usually govern persons in walks of life accounted much more exalted than that of the great body of workmen in our manufactories: this is the only remedy upon which I can found any hope; but, were I standing upon the threshold of life, just about to enter upon its duties, and possessing in the commencement of my career the benefit of the few observations which I have made, the little truth I have gleaned in the years which I have numbered, I should even then consider the hope as utopian that I should live to witness the dawn of such a state of things in the humbler walks of life; for, warmly as I now feel in favor of a system of universal education, and great as I believe the benefits which are to be derived from it, I do not entertain a hope that by any effort, merely human, the great body of any community can be so far elevated above the level at which they now stand, as to induce them to act the philosopher in cases of this description. At all events, I am fully of opinion that so far as governments are concerned in the regulation of trades and callings, they ought to be, as they generally have been, confined in their action to the prevention of nuisances; that artisans and manufacturers should be allowed to pursue their own business in their own way; and that *Laninez nous faire*, should be their motto."—[Ed. M. M.]

Fall in the price of Men in France.—Towards the close of the Imperial regime in France as high as £500 sterling ($2200) was, it is stated in the London Spectator, "frequently paid for a substitute in the Conscription. At present, straight, healthy, apt young fellows cost under £10 st. ($44) each."—The reason assigned for this fall in the price of man is, that "such men as have no other property than their *sinews*, are far more numerous than twenty years ago, and wages are reduced in the same proportion." This comes of what Shakspeare expressively calls "the cankers of a calm world and a long peace."

Compensating Pendulums.—Mr. Henry Robert, pupil of Breguet, has, by availing himself of the well known quality possessed by the wood of the fir tree of preserving its length unaltered in all changes of temperature, and confining a rod of this wood in a metal box, the expansion of the bob correcting that of the tube, succeeded perfectly in making a pendulum, uniting all the requisites of a good compensator, and at the same time simple in its construction and form.—[Acad. des Sciences.]

M. Latreille, the celebrated French naturalist, died Feb. 6th at Paris. His death creates a vacancy in the Academy of Sciences, and the professorship at the Museum of Natural History.

Rival Orators.—Mr. Fox used to say, "I never want *a* word, but Pitt never wants *the* word." This story occurs in many memoirs of the time.—[Murray's Byron, vol. 14.]

METEOROLOGICAL RECORD.

MONTREAL, L. C.

Date.	Thermometer.		Barometer.		Weather.
	7 a.m.	3 p m.	7 a.m.	3 p m.	
Jan. 1..	38 x	43 x	29.88	30.43	rain—fair
" 2..	10	28	30.68	.62	fair
" 3..	17	31	.41	.33	..
" 4..	35	49	.04	.06	rain—cloudy
" 5..	33	28	.13	29.97	.. — ..
" 6..	37	38	29.84	.82	fair
" 7..	18	15	30.04	30.02	..
" 8..	23	30	29.94	29.88	..
" 9..	25	38	.54	.52	..
" 10..	31	31	.48	.61	..
" 11..	12	4	.89	.96	..
" 12..	3	14	.96	.98	snow—fair
" 13..	21	28	.92	.77	..
" 14..	19	5	.67	.89	.. —fair
" 15..	9	12	.46	30.21	.. — ..
" 16..	20	25	.21	29.47	.. — ..
" 17..	19	2	30.38	30.25	fair
" 18..	14	3	29.95	.30	..
" 19..	25	13	30.76	.45	..
" 20..	23	34	.18	.04	fair—snow
" 21..	32	40	29.79	29.87	..
" 22..	37	30	.87	.16	..
" 23..	27	32	30.[illegible]0	30.17	..
" 24..	23	43	.14	.06	..
" 25..	29	30	29.53	29.34	snow
" 26..	3	11	30.30	30.38	fair
" 27..	0	19	.37	.22	..
" 28..	6	11	.12	.27	..
" 29..	6	14	.36	.18	..
" 30..	10	23	29.84	29.87	snow—fair
" 31..	0	11	.93	30.01	fair

CHARLESTON, S. C.

Date.		Thermometr			Wind.	Weather.
		7 a. m.	2 p. m.	9 p. m.		
January	1	61	66	61	S	cloudy—rainy morning
"	2	58	67	62	NE	..
"	3	57	67	61	E	..
"	4	58	62	61	NE	rain
"	5	55	62	61	..	cloudy—drizzle
"	6	56	73	64	W	fair
"	7	57	70	64	SW	cloudy—rain at night
"	8	54	48	43	NW	..
"	9	46	57	51	SW	fair
"	10	42	42	29	W	cloudy—a little snow
"	11	20	35	31	..	..
"	12	30	32	42	..	fair
"	13	38	48	48	S	cloudy—rain at night
"	14	48	58	49	W	cloudy—drizzle
"	15	49	59	59	E	..
"	16	58	60	52	SW	.. —rain in morning
"	17	38	42	37	N	..
"	18	30	52	42	..	fair
"	19	38	48	45	NE	..
"	20	42	47	50	..	..
"	21	44	68	54	S	..
"	22	52	64	55	..	..
"	23	50	61	56	..	..
"	24	50	56	51	N	cloudy—drizzle
"	25	46	56	48	W	.. — ..
"	26	38	48	43	E	fair
"	27	40	58	46	S	..
"	28	44	60	47	E	..
"	29	52	60	56	..	cloudy—rain
"	30	62	61	58	S	rain—hazy rain at night
"	31	56	64	60	SW	cloudy—drizzle at night

AVOYLLE FERRY,

ON RED RIVER, LOUISIANA.

Latitude 31:10 N. longitude 91:59 W, from Greenwich, nearly.

[Communicated for the American Railroad Journal.]

Date. 1833.	Thermometr			Wind.	Weather.
	morning	noon	sun set		
Tuesd, Jan. 1	63	67	68	calm	cloudy morn'g—clear ev'g
Wednesday, 2	62	66	66	..	foggy morn.—cloudy all d.
Thursday, 3	63	70	73	south	clear—calm evening
Friday, 4	65	73	74	..	cloudy—clear evening
Saturday, 5	64	68	68	calm	cloudy
Sunday, 6	64	68	67	..	..
Monday, 7	62	57	53	north	.. —very much rain
Tuesday, 8	44	58	54	calm	clear
Wednesday, 9	46	54	48	n. w.	.. —high wind
Thursday, 10	34	50	42	calm	..
Friday, 11	32	52	49	..	..
Saturday, 12	42	59	56	..	cloudy
Sunday, 13	55	65	68	..	clear
Monday, 14	54	60	60	..	cloudy
Tuesday, 15	68	72	68	south	cloudy and rain
Wednsday, 16	51	51	48	north	clear
Thursday, 17	34	47	40	..	..
Friday, 18	30	57	52	calm	..
Saturday, 19	40	62	57	..	..
Sunday, 20	49	64	65	..	..
Monday, 21	54	69	69	..	..
Tuesday, 22	50	61	70	..	foggy morning—clear day
Wednsday, 23	64	67	63	w. & n. w.	clear—severe gale all day
Thursday, 24	42	65	58	calm	clear
Friday, 25	50	58	54	north	..
Saturday, 26	34	61	61	calm	.. —cloudy night
Sunday, 27	46	66	64	..	..
Monday, 28	48	56	60	..	cloudy, and rain all night
Tuesday, 29	61	68	68	south	cloudy, rain and thunder
Wednsday, 30	62	72	66	calm	cloudy in even'g—high w. [wind
Thursday, 31	50	61	59	n. w.	clear

The range of the Thermometer (Fahrenheit's) has been regularly entered in the morning between day break and sun rise, at noon between 12 and 1 p. m., and at night between sun set and dark.

METEOROLOGICAL RECORD, KEPT IN THE CITY OF NEW-YORK.

From the 1st to the 25th day of March, 1833, inclusive.

[Communicated for the Mechanics' Magazine and Register of Inventions and Improvements.]

Date.	Hours.	Barometer.	Thermometer.	Winds.	Strength of Wind.	Clouds from what direction.	Weather and Remarks.
Friday, Mar. 1	6 a. m.	30.16	20	NE	fresh		snow
	10	.07	20	..	..		..
	2 p. m.	29.99	24	..	..		..
	6	.95	24	..	..		snowy
	10	.90	22	..	moderate		..
Saturday, 2	6 a. m.	.89	20	WSW-W by S-W	..	WNW	fair—scuds from WNW
	10	.84	28	WSW—W by N	st'g-gale	W and WNW	.. —hard snow squalls
	2 p. m.	.98	16	NW	gale	WNW	fair
	6	30.13	11	..	strong	..	..
	10	.23	8	..	..	..	..
Sunday, 3	6 a. m	.28	8	WSW	fresh		..
	10	.26	21	..	..	WSW	.. —cloudy
	2 p. m.	.08	22	SW by W	..	..	cloudy
	6	29.90	22	..	..	..	..
	10	.89	23		moderate	..	..
Monday, 4	6 a. m.	30.04	19	NW—NNW	..—fresh	NW	fair—scuds from NW
	10	.10	22	NW	strong	NW by N	..
	2 p. m.	.18	24	NW by N	fresh	..	..
	6	.27	21	..	moderate		clear
	10	.35	15	..	..		..
Tuesday, 5	6 a. m.	.45	12	NW	light	WSW	fair
	10	.48	21	NW—WSW	moderate	..	.. —thin *cir rus* from WSW
	2 p. m.	.44	23	WSW—SW	..	..	.. —cloudy
	6	.30	21	SW	..	..	cloudy
	10	.19	21	..	..		snowy
Wednesday, 6	6 a. m.	29.89	21	NNE—N	..	W by S	snow—fair
	10	.90	24	NNW	..	$\left\{\frac{\text{WSW}}{\text{W}}\right\}$	fair
	2 p. m.	.97	32	..	fresh	NW	.. —cloudy
	6	30.04	30	..	moderate	..	cloudy—fair
	10	.14	25	..	..	..	fair
Thursday, 7	6 a. m.	.20	24	WSW	light	W	cloudy
	10	.20	29	SW—SSW	moderate	W by S—WSW	..
	2 p. m.	.11	35	SSW—S	..	WSW—SW	.. —clear
	6	.00	34	S	..		clear
	10	29.99	32	..	..	W	fair
Friday, 8	6 a. m.	.94	33	..	..	SW by W	cloudy
	10	.89	38	SSE—variable	light	..	fair
	2 p. m.	.83	42	ESE—E	..	..	cloudy
	6	.78	39	E	..	..	.. —fair—cirrus at WSW
	10	.77	37	ENE	..	..	cloudy
Saturday, 9	6 a. m.	.80	33	N	..	..	fair
	10	.89	42	NNW—W	..	..	..
	2 p. m.	.81	41	WNW—SW	..		clear
	6	.83	40	SSW	..		..
	10	.89	35	..	..		..
Sunday, 10	6 a. m.	30.01	32	SW	..	WSW	fair
	10	.06	44	ENE	faint	..	..
	2 p. m.	.08	45	..	light	W by S	.. —cloudy
	6	.10	40	..	moderate	..	cloudy
	10	.11	38	..	..		rainy
Monday, 11	6 a. m.	.24	30	NNE	..	NNE	cloudy—thick low scuds
	10	.30	34	NE by E	..	NE by E	fair — ..
	2 p. m.	.30	39	NE—ENE	..	NE—ENE	.. — ..
	6	.30	37	E	..	$\left\{\frac{\text{W by S}}{\text{E}}\right\}$	.. —cloudy
	10	.31	36	..	..		cloudy
Tuesday, 12	6 a. m.	.39	36	ENE	..		.. —foggy
	10	.27	33	..	..		.. — ..
	2 p. m.	.18	27	..	..		.. — .. —rainy
	6	.10	37	..	..		rainy— ..
	10	.04	36	NE	fresh		rain
Wednesday, 13	6 a. m.	.00	34	N—NW	..	W by S	cloudy
	10	.10	34	NNW—W	..	..	fair
	2 p. m.	.13	36	NW	strong	NW	.. —scuds from NW
	6	.14	33	..	fresh	..	..
	10	.35	30	..	moderate	..	..

NEW-YORK.

Date.	Hours.	Barometer.	Thermometer.	Winds.	Strength of Wind.	Clouds from what direction.	Weather and Remarks.
Thurs. Mar. 14	6 a. m.	30.45	26	NNW—W	f'nt-calm		clear
	10	.51	36	WSW—SW	calm-l'ht		..
	2 p. m	.52	36	SSW—S—SSW	moderate		..
	6	.38	32	S—SSE	..		..
	10	.39	32	S	..		..
Friday, 15	6 a. m.	.24	34	SSW	..	WSW	cloudy—floating ice continues plenty
	10	.24	37	SW—S by W	light	WSW / NW	.. —fair
	2 p. m.	.24	46	WSW—NW	..—faint		clear
	6	.24	45		calm		..
	10	.29	42		..		
Saturday, 16	6 a. m.	.41	34	NNE	light	NW	fair
	10	.47	44	NE	..	..	..
	2 p. m.	.46	46	NE by E	..		clear
	6	.43	42	NE	..		..
	10	.46	38	..	..		..
Sunday, 17	6 a. m.	.52	30	.. —ENE	moderate		..
	10	.56	38	E—ESE	..	E	fair—low scuds from E
	2 p. m.	.51	41	ESE—SSE	..	ESE—SSE	— ..
	6	.48	37	S by E	..	S by E	cloudy— ..
	10	.47	36	..			fair— ..
Monday, 18	6 a. m.	.33	36	S by W	faint	SSW	cloudy— ..
	10	.33	38	..	..	..	.. —fair
	2 p. m.	.21	49	S	moderate		clear
	6	.18	43	..	..		..
	10	.19	42	..	light		..
Tuesday, 19	6 a. m.	.15	43	SW	..	WSW	cloudy
	10	.16	47	SSW—S	..	..	fair
	2 p. m.	.12	61	S—SSE	..	..	.. —cloudy
	6	.11	53	SSE	..	..	rainy
	10	.14	50	SE	..—mod.		cloudy—rain
Wednesday, 20	6 a. m.	.13	42	NE by E	moderate		rain
	10	.13	42	NE by E—ESE	—light		..
	2 p. m.	.05	46	ESE—SE	..		foggy and rainy
	6	29.98	48	SE	..		.. ..
	10	.95	46	..	..		.. ..
Thursday, 21	6 a. m.	.83	48	SSE	faint		thick fog
	10	.85	54	..	..	SSE	cloudy and foggy
	2 p. m.	.80	59	S—SSW	moderate	SSW—SW	cloudy—rainy
	6	.69	54	SW	light	SW	cloudy
	10	.65	53	..	..	..	..
Friday, 22	6 a. m.	.69	47	SW—WSW	..	WSW	fair
	10	.71	54	WNW	moderate	WSW / W by N	.. —cloudy
	2 p. m.	.71	55	W—W by S	fr'h-mod.	W by N—NW	cloudy—fair
	6	.74	52	W	moderate	W	fair
	10	.82	47				clear
Saturday, 23	6 a. m.	.99	47	NW—W	faint		..
	10	30.04	54	SSW	light		..
	2 p. m.	.04	56	SSW—S	..		..
	6	29.97	52	S	..		..
	10	.97	44	SSW	..		..
Sunday, 24	6 a. m.	.97	40	..	..		..
	10	.94	50	SSW—SSE	fa't-mod.	WSW / S	fair—small strips of cirri from WSW
	2 p. m.	.87	56	SSE—SE	moderate	.. / ..	hazy—cloudy
	6	.78	46	SE	..	S	cloudy
	10	.75	44	..	light		..
Monday, 25	6 a. m.	.61	42	N	..	S by W / N	..
	10	.62	46	..	..	..	fair
	2 p. m.	.57	57	N by W—NNW	moderate	WNW / NNW	..
	6	.60	53	N by W	light	NNW	..
	10	.70	46				

Average temperature of the week ending March 6th, being the coldest week of the season, 21.14.—Do. of the week ending March 11th, 32.25.—Do. of the week ending March 18th, 36.—Do. of the week ending March 25th, 49.54.